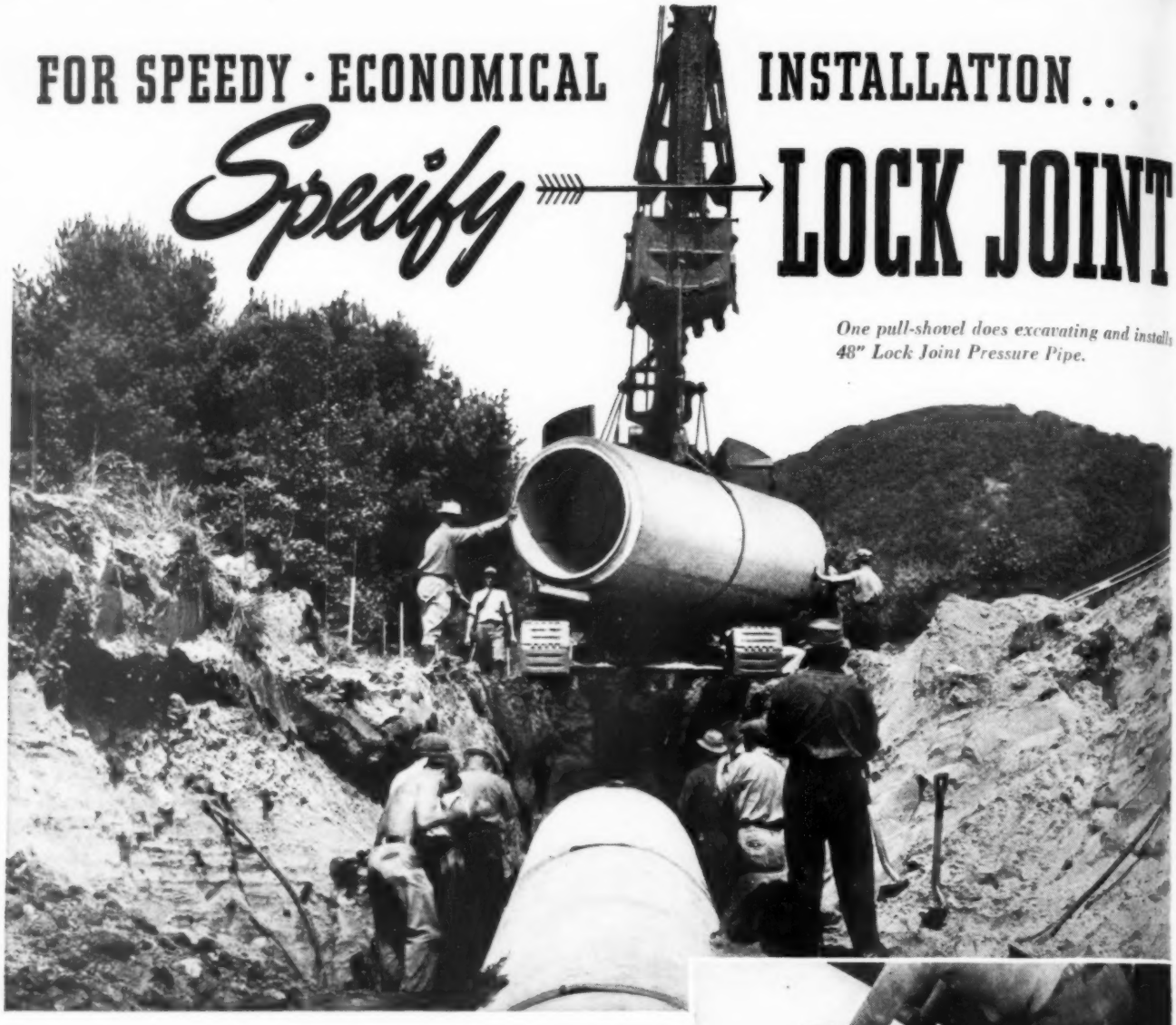
WATER & SEWAGE WORKS

SAN JUAN'S 48" SUPPLY LINE TO NEW 30 MGD. FILTER PLANT

FOR SPEEDY · ECONOMICAL INSTALLATION . . .

Specify LOCK JOINT

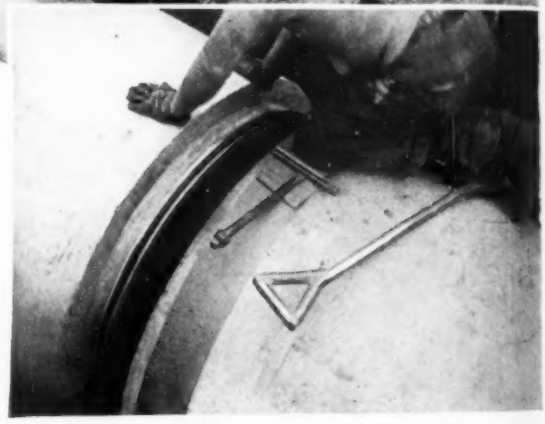


One pull-shovel does excavating and installs 48" Lock Joint Pressure Pipe.

• • • With its exclusive Rubber and Steel Joint, Lock Joint Reinforced Concrete Pressure Pipe is installed rapidly and efficiently in extremes of heat or cold—in wet ditch or dry.

Only one machine is required to make the excavation and install the pipe. No caulking or bolting of the joint is necessary, and the pipe may be back-filled immediately. The Rubber and Steel self-centering expansion joint is flexible to accommodate ground settlement, and is watertight at any internal pressures common to American Water Works practice.

Today, millions of feet of Lock Joint Reinforced Concrete Pressure Pipe, equipped with the Rubber and Steel Joint, installed at low cost and needing little or no maintenance, are giving unfailing service throughout the Western hemisphere.



Rubber and Steel Joint ready to be pushed home.

LOCK JOINT PIPE COMPANY

Est. 1905

P.O. Box 269, East Orange, N. J.

PRESSURE PIPE PLANTS: Wharton, N. J. • Turner, Kan. • Detroit, Mich.

BRANCH OFFICES: Cheyenne, Wyo. • Denver, Colo. • Kansas City, Mo. • Valley Park, Mo. • Chicago, Ill. • Rock Island, Ill. Wichita, Kan. • Kenilworth, N. J. • Hartford, Conn.

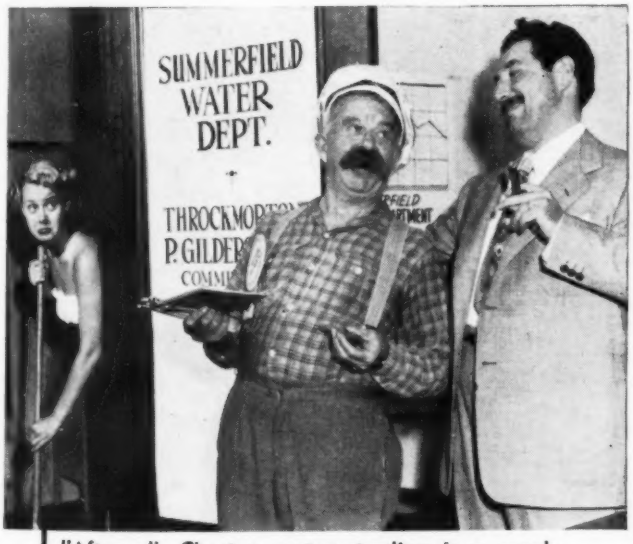
SCOPE OF SERVICES—Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

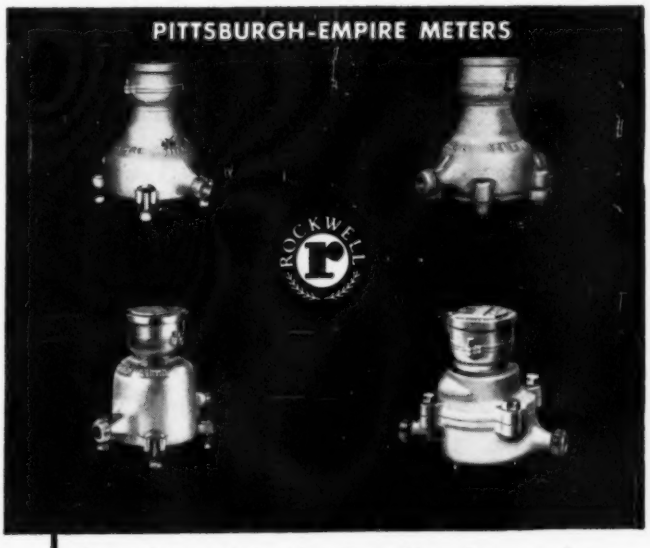
WATER AND SEWAGE WORKS. Reg. U. S. Patent Off. November, 1949. Volume 96. Number 11. Published monthly by Gillette Publishing Co., at 404 North Wesley Ave., Mount Morris, Ill. Per copy, 25c; Subscription rate: United State, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as second-class matter March 4, 1948, at the post office at Mount Morris, Illinois, under Act of March 3, 1879. Executive and business offices, 22 W. Maple St., Chicago 10, Illinois. Editorial office, 155 E. 44th St., New York 17, N. Y.

If there isn't a meter at the top of this pole, one of Gildy's new Meter Readerettes is going to have a little trouble. Gildy's scheme seems to be going to the dogs, doggonit.

Gildersleeve's new twist takes a nasty turn as the complaints pour in. "My water bill looks like I'd been backfilling Hoover Dam." Chester Conklin says, "Here's another beef." Gildy moans.



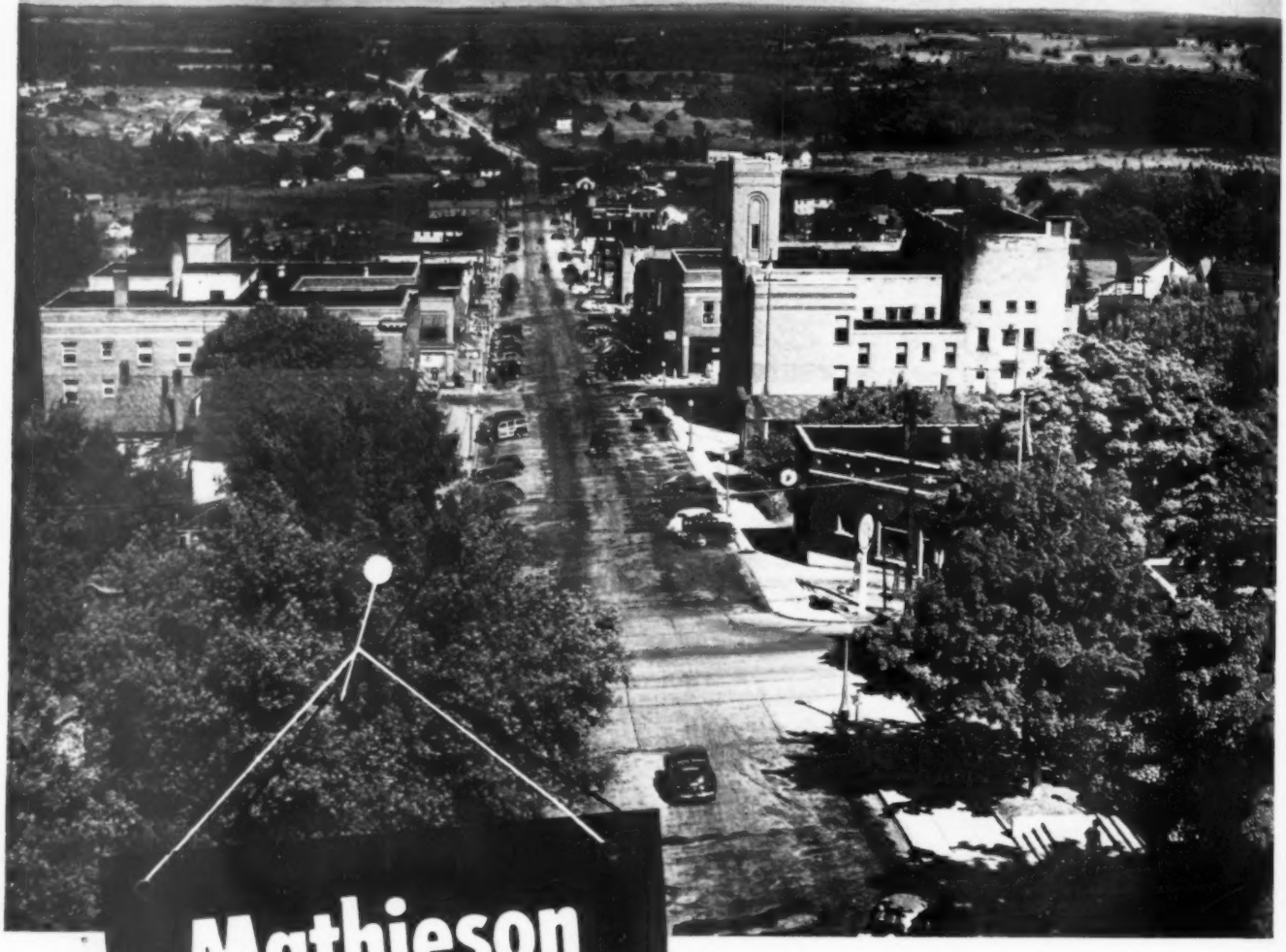
"After all, Chester, meter reading is a man's job," says Gildy. Go out and read those Pittsburgh meters right so we can reap the profit as never before. Good old faithful, dependable Chester, you're for me."



Seriously speaking, there's nothing that equals these meters for faithful performance, extreme accuracy and long life.

PITTSBURGH EQUITABLE METER DIVISION

taste-free water for thirsty towns



Mathieson
CHLORINE DIOXIDE
WATER TREATMENT

- ★ Highly effective bactericidal and sporicidal action.
- ★ Destroys chlorphenols.
- ★ Eliminates unpleasant tastes and odors due to algae and other contaminants.
- ★ Removes manganese.
- ★ Maintains residual throughout distribution system.

Most people take pure water for granted... seldom talk about it. But they can certainly clamor about unpleasant tastes and odors in the water that flows from the kitchen tap or the bathroom shower.

That is why Mathieson Chlorine Dioxide Water Treatment—the *better* way to produce good-to-drink water—is being hailed by more and more water works engineers from coast to coast.

Mathieson Chlorine Dioxide eliminates unpleasant tastes and odors—gives an added margin of safety in disinfection—provides an effective residual to the ends of the lines. Write for details. Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Maryland

Chlorine Dioxide . . . Sanitation HTH . . . Liquid Chlorine . . . PH-Plus (Fused Alkali) . . . Caustic Soda . . . Soda Ash
Bicarbonate of Soda . . . Ammonia, Anhydrous & Aqua . . . Carbonic Gas . . . Dry Ice . . . Sodium Chlorite Products . . Sodium Methylate

WATER & SEWAGE WORKS

WATER SUPPLY—SEWAGE DISPOSAL—INDUSTRIAL WASTE TREATMENT

E. S. GILLETTE, Publisher

L. H. ENSLOW, Editor

COMING

Fluoridation—1949

In our November 1948 issue an article by H. A. Faber discussed the pros and cons of Water Flouridation under the caption "Shall Fluorides Be Added to Public Water Supplies?" In the interim much water has flown under the bridge in fluoridation and it is now timely to publish a follow-up article which relates flouridation developments of the year, and brings this important subject up to date. Again the author is Editorial Associate—

HARRY A. FABER, Research Chemist,
The Chlorine Institute, New York.

Sewer Maintenance & Operation

Practices in sewer maintenance and operation in Los Angeles will be set forth in a series of short pithy articles by—

REUBEN F. BROWN, Supt.
Sewer Maint. & Operation, Los Angeles, Calif.

Softening Plant Capacity Doubled at La Verne

Is the title of the article which describes the increase in size of the water softening and filter plant of the Metropolitan Water District for Southern California at La Verne, Calif. How this combination lime and zeolite softening plant was increased from 100 to 200 mgd. capacity is told by—

W. W. AULTMAN, Water Purif. Engr.,
Metropolitan Water Dist. of Southern Calif.

Taste and Odor Control at Valparaiso, Ind.

Relates experiences for more than a year with chlorine-dioxide treatments which has proved highly effective in combatting an aggravating taste and odor problem. The report comes from—

RICHARD COOTE,
Supt. of Filtr., Valparaiso, Ind.

The B.O.D. Test—a Critical Examination

Constitutes a report on the chief shortcomings of the Standard 5 Day B.O.D. Test with warnings to users of the test when applied to sewages as well as trade wastes. Considering the number of potential vitiating influences the investigator offers a number of warnings to those who may not adequately appreciate the deficiencies of the B.O.D. test or the value of the C.O.D. (chemical oxygen demand) test in combination with the biologic demand test. This critical analysis comes from—

ROBERT S. INGOLS, Research Prof.,
Ga. Institute of Technology, Atlanta, Ga.

Water Treatment Experiences

A well qualified chemist and superintendent of water treatment with varied experience and keen observation will set forth some of his "Experiences in Water Treatment" in a series of articles, designed to be helpful to the less experienced and interesting to all. The author of this new series will be—

ALBERT H. ULLRICH, Supt.
Water & Sewage Treatment, Austin, Tex.

Maintaining Transmission Line Capacity with Ammonia-Chlorine Treatment

Has now been successfully practiced at Utica, N. Y., for 15 years. Observations on this treatment at Utica at the end of the first 3 years were first reported in this magazine in 1937. Now after 12 more years of operation, some definite and indisputable conclusions have been drawn by

L. J. GRISWOLD, Engr.,
Bd. of Water Supply, Utica, N.Y.

New Penna. Section's First Meeting

Is covered in a report intended for this issue, but regrettably must be held for the next.

Associate Editor

GEORGE E. SYMONS, Ph.D.

Editorial Associates

J. R. BAYLIS
A. M. RAWN
H. A. FABER

Adv. Editor
H. J. CONWAY

Make-Up Editor
L. D. SANDERS

VOL. 96, NO. 11 **CONTENTS** NOVEMBER, 1949

N.E.W.W.A. 68th Annual Convention 407

Experiences With Break-Point Chlorination 415
By Chas. M. Gard
Columbus, Ohio

A Reservoir Diffusion System 419
By Wm. C. Morse
Seattle, Washington

Little Rock Increases Filter Plant Capacity 420
By L. A. Jackson
Little Rock, Arkansas

Puerto Rico Providing Comprehensive Water Supply and Sewerage Systems 422
By Leonard Bourne
San Juan, P. R.

Westchester Water Works Conference and Outing 424

Preconditioning and Digestion of Sewage Sludge, Part 5 425
By T. R. Haseltine
Pittsburgh, Pennsylvania

Effects of Sewage Quality and Condition Upon Plant Operation and Efficiency 429
By Elson T. Killam
New York, New York

Huron, So. Dak., Treats Sewage and Packing House Waste 431
By E. H. Dunmire
Lincoln, Nebraska

How Metallizing Is Used in Water and Sewage Works 435
By Rick Mansell
Los Angeles, California

Small City Combined Water and Sewage Management Effective 439
By John E. Winskill
Sullivan, Illinois

Penna. Water Works Operators' Assn. Annual Conference 443

Diffuser Plates Cleaned by Oxy-Acetylene Flames 447

Editorial 448

Meetings Scheduled 76A

"Here and There" with Doc Symons 77A

Manufacturers' and Equipment News 83A

Literature and Catalog Reviews 92A

Water & Sewage Works is indexed regularly by Engineering Index, Inc.

Publication Office, 404 N. Wesley Ave., Mt. Morris, Ill.

(Address communications to the Executive Office or the Editorial Office)

EXECUTIVE OFFICE
22 W. Maple St., Chicago 10, Ill.

EDITORIAL OFFICE
155 E. 44th St., New York 17, N. Y.

H. P. GILLETTE, Pres.; E. S. GILLETTE, Vice Pres.; L. H. ENSLOW, Vice Pres.

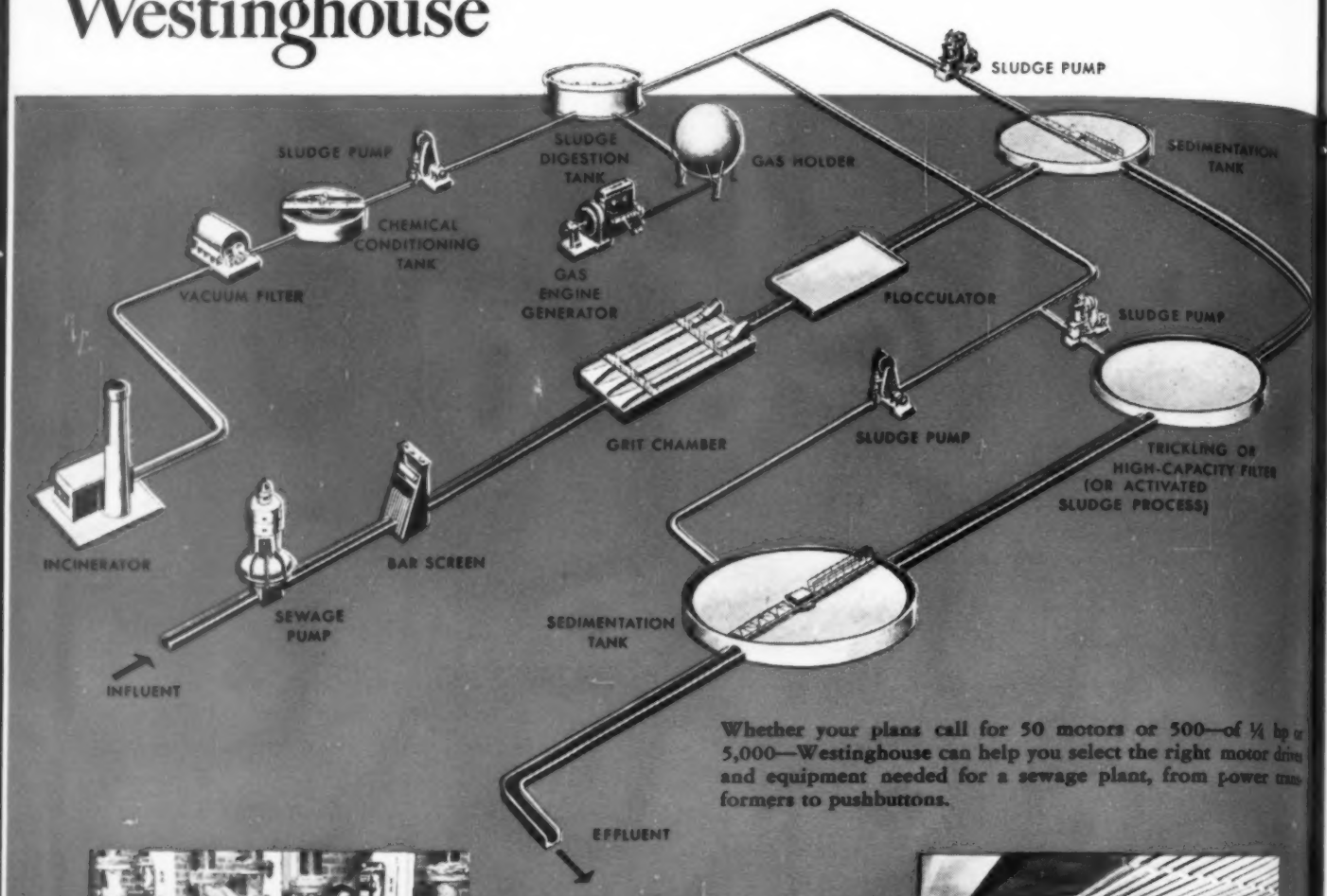
New York Office ..... H. D. Crippen, Mgr., 155 E. 44th St.
F. A. Michel, E. J. Kall, Rep.
Chicago Office ..... M. B. Nylund, Rep., 22 W. Maple St.
R. T. Wilson, Rep.
Cleveland Office ..... Lee B. McMahon, Mgr., Leader Bldg.
Los Angeles Office ..... Don Harway, Rep., 1709 W. Eighth St.
San Francisco Office ..... Nelson Harway, Rep., 57 Post St.

WATER AND SEWAGE WORKS is a monthly publication. Single Copies, 25c; Subscription Rates, U. S. and Canada, $2 per year; Foreign, $3.

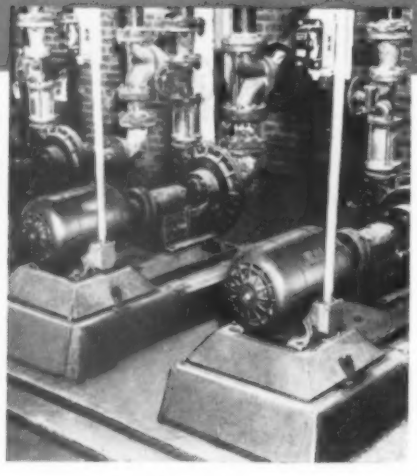
(Member—Audit Bureau of Circulation and Associated Business Papers.)

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



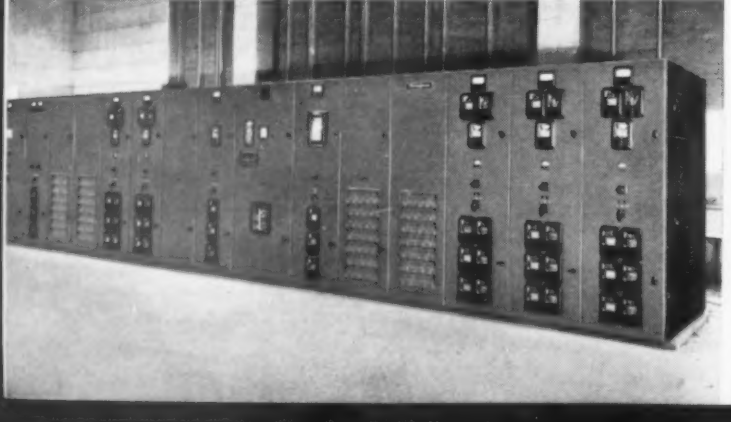
Whether your plans call for 50 motors or 500—of ¼ hp or 5,000—Westinghouse can help you select the right motor drives and equipment needed for a sewage plant, from power transformers to pushbuttons.



Life-Line motors which need no lubrication being used on a typical pumping application such as encountered in most sewage plants.

This control center provides a central location for operating all pump, blower and miscellaneous motor drives (600 volts and below) for the surrounding area.

Westinghouse Indoor Metal-clad Switchgear (2,300 volts) for feeder circuits to main pump motors. It's assembled at the factory and installed as a packaged unit to provide protection for vital equipment.



Two Westinghouse Two-speed Vertical CS Motors driving main sewage disposal pumps (one 350/160 and the other 250/100 hp). For emergency conditions, motors have a high-speed rating, can handle 300% of normal capacity.

UNIT ELECTRICAL RESPONSIBILITY

plus practical application help

Satisfactory operation of your sewage plant depends, in a large part, on the electrical equipment which powers and controls its drives. Consider the advantages to you of obtaining all this electrical equipment from one reliable source that will provide you a well co-ordinated, dependable and economical installation based on a practical understanding of sewage plant problems.

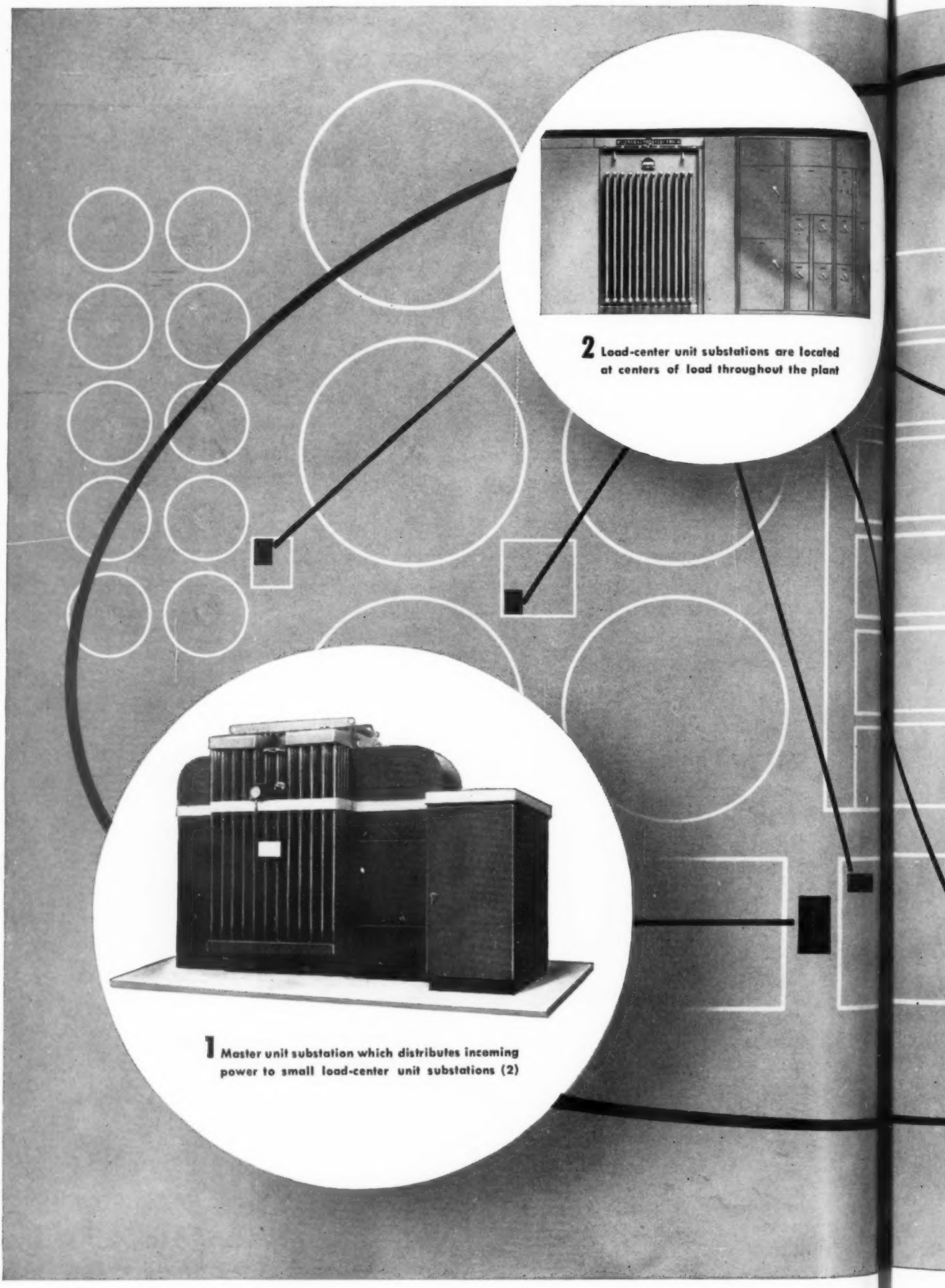
Westinghouse provides that source. Our Consulting and Application Engineers have had extensive experience in applying electrical equipment to sewage plants. They will recommend the right equipment for every step in your sewage treating process.

This unit responsibility does not cease with the installation. Our nationwide chain of Manufacturing and Repair Plants and Renewal Parts Warehouses provide you at all times with top-flight maintenance service.

Unit electrical responsibility means economy and efficiency for you. Call your nearest Westinghouse Office or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

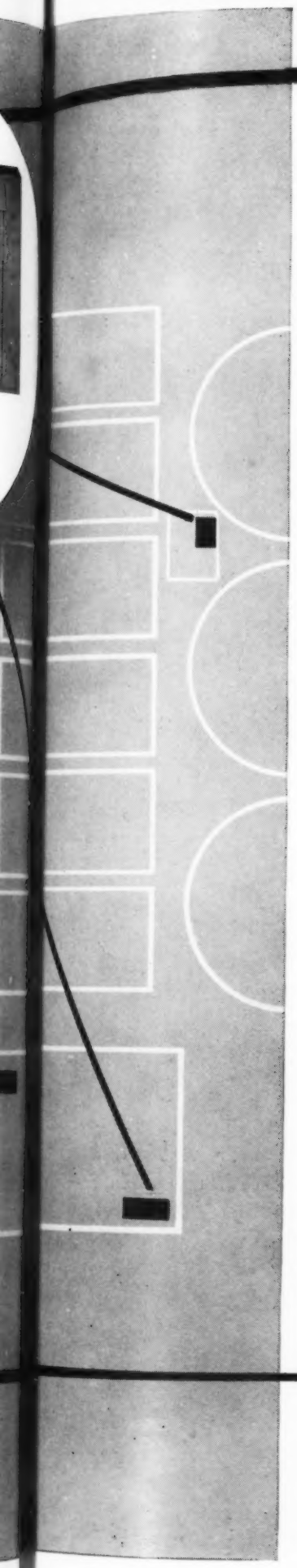
J-94795

Westinghouse



2 Load-center unit substations are located at centers of load throughout the plant

1 Master unit substation which distributes incoming power to small load-center unit substations (2)



Specify LOAD-CENTER Power Distribution!

This modern technique offers more protection for men and equipme.. saves space, keeps utilization voltage normal, simplifies maintenance, increases operating efficiency, streamlines plant appearance—ALL AT LOWER INSTALLED COST

Load-Center Power Distribution—the system which distributes incoming power at 2400 or 4160 volts from a master unit substation (1) to small load-center unit substations (2) located near the centers of electrical load—has received quick acceptance in the water and sewage fields because it offers these advantages over previous systems:

SAFETY— Metal enclosures house in one unit the transformer, switchgear or control, and interconnections; no exposed buses or bushings to create a hazard.

LESS SPACE— Unit substations take less space than an assortment of components because they are designed as a unit, interconnections are short.

EASY INSTALLATION AND MAINTENANCE— Unit substations are factory-assembled and tested, ready for immediate installation. Their enclosures protect against dirt and foreign particles, yet doors allow ready access to compartments for inspection.

HIGH EFFICIENCY— By locating unit substations near the centers of electrical load throughout the plant, secondary feeders are kept short, power loss low. Load voltage stays up.

ATTRACTIVE APPEARANCE— Unit substations streamline your water or sewage plant because they enclose all power distribution equipment in one attractive metal enclosure. Cable connections may be made underground to eliminate unsightly overhead wires and poles. The small substations at the load centers may be combined with G-E Cabinetrol to give a compact, attractive distribution and control center.

You get all these features at LOWER INSTALLED COST than if you purchased the components separately! Your consulting engineer or General Electric representative will tell you more about Load-Center Power Distribution, and help you plan your entire electrical layout. Call today, or write for Bulletin GEA-3785, "Load-Center Power Distribution." *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

CO-ORDINATED WATER-PLANT . . . SEWAGE-PLANT ELECTRIFICATION

GENERAL ELECTRIC

666-53

Installed "for keeps"

No community should have to take up, replace, and *pay twice for* a water distribution system. But it has been done! Whole systems, constructed with other kinds of pipe, have been dug up because of ruinous maintenance costs, and replaced with cast iron pipe.

Why should any community planning a public water supply system, or extensions to an existing system, contemplate such a risk? When it is well known that many cities in the United States and Canada have cast iron water mains in service that were installed over a century ago. And a survey conducted by eminent water works engineers shows that 96% of all six-inch and larger cast iron water mains *ever laid* in 25 representative cities are still in service. And reports from 195 water works superintendents show that the maintenance-cost of cast iron mains is little or nothing.

When you lay cast iron pipe, you lay it "for keeps"—and you pay for the pipe and the labor, *only once.* Cast Iron Pipe Research Association, Thomas F. Wolfe, Engineer, 122 South Michigan Ave., Chicago 3.

CAST IRON PIPE

-paid for but once!

SERVES FOR CENTURIES

CHICAGO

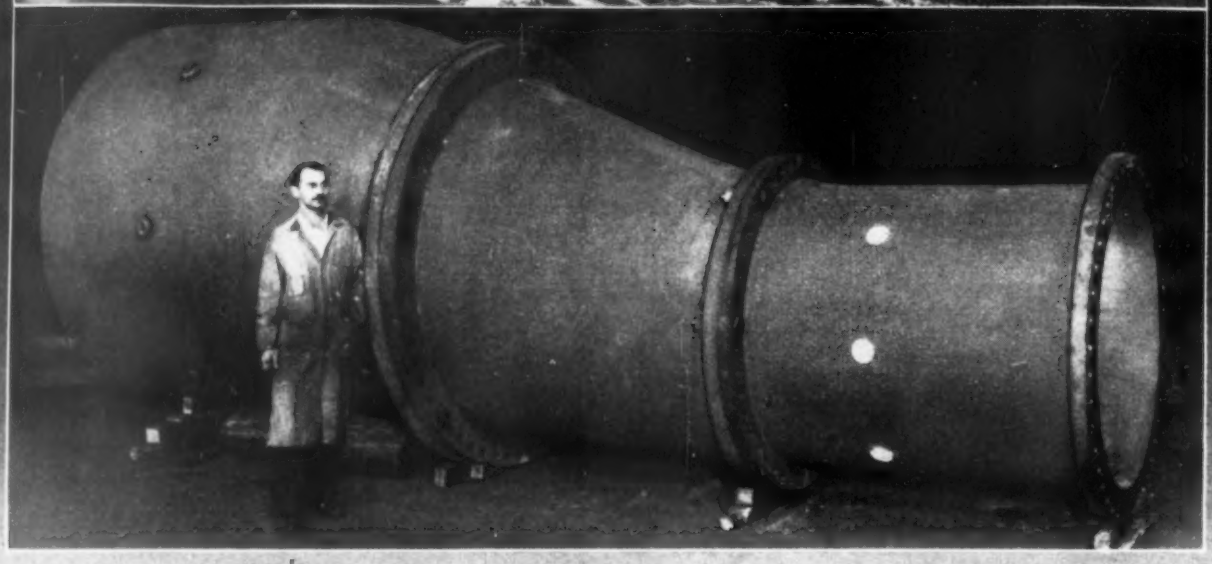
Southwest Treatment Works

Sanitary District of Chicago

(To be completed in 1950)

Sanitary District of Chicago
WILLIAM H. TRINKAUS
Chief Engineer

Sanitary District of Chicago
NORVAL E. ANDERSON
Design Engineer



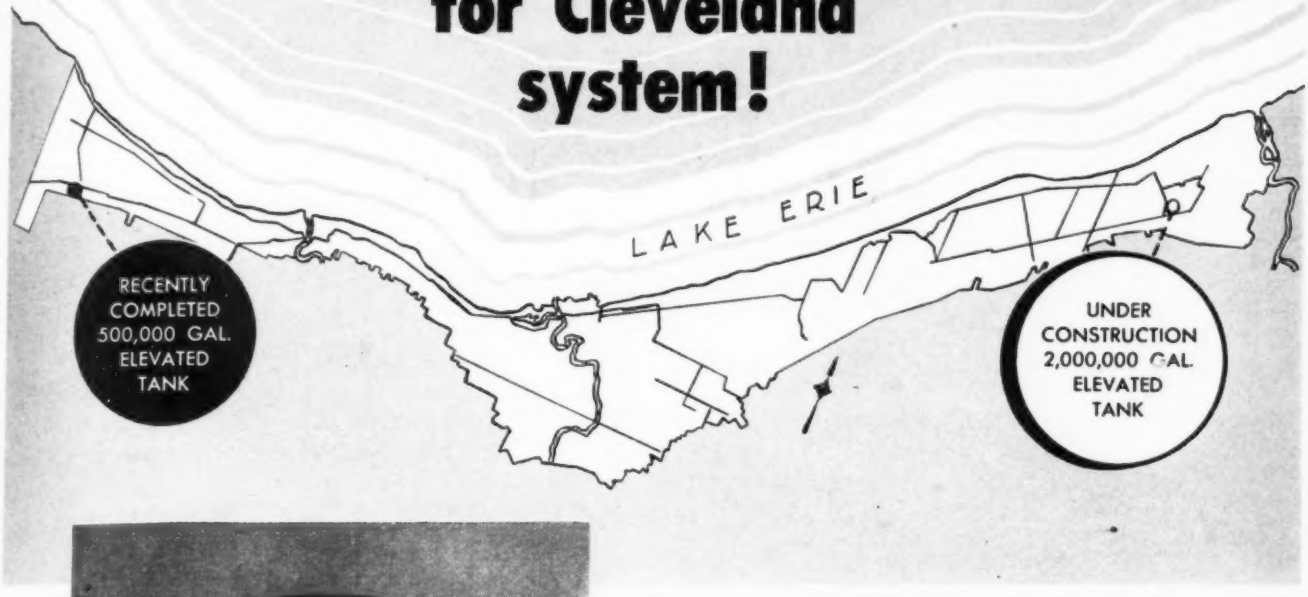
The gigantic Southwest Treatment Works will soon be capable of handling almost a billion gallons of sewage each day; more than any other single sewage treatment plant in the world. When completed, this plant and the other units of the Sanitary District of Chicago will serve 6,500,000 people in Cook County and will contribute further to the outstanding sanitation record of this major center of population. In the original plant and in the new construction, which more than doubles the original capacity of the Southwest Works, Builders Venturi Flow Meters and Chronoflo Electric Telemeters have been installed to measure the enormous flows of raw sewage, return and waste sludge, mixed liquor, and air. For Bulletins describing Builders sewage works equipment, address Builders-Providence, Inc. (Division of Builders Iron Foundry), Providence 1, R. I.

Builders-Providence equipment furnished for the addition to the Southwest Treatment Works:

4 — 100" Raw Sewage Meters
1 — 78" Return Sludge Meter
8 — 66" Mixed Liquor Meters
1 — 20" Waste Sludge Meter
69 — Air Meters (72" to 4")

BUILDERS PROVIDENCE
Instruments

DISTRIBUTED ELEVATED STORAGE ...better water service for Cleveland system!



Better water service is assured for both the east and west edges of the Cleveland, Ohio system because each area has (or will have) enough water in storage to meet peak demands. As the map above shows, two new elevated tanks are strategically located to provide constant water pressure for outlying heavy demand regions. Thus, the improved water service is based on the use of *distributed elevated storage.*

The Westlake and Bay Village regions adjacent to Cleveland on the west are supplied with gravity water pressure by the recently-completed 500,000-gal. Horton tank shown at the left. This tank is the sole means of water storage for a 20-square-mile area which has a population of about 25,000. The eastern edge of the system will be served by a 2,000,000 gal. tank of similar design which is now under construction.

When you "distribute" your storage in Horton elevated tanks, you get more than a source of unfailing gravity water pressure. Their welded construction makes maintenance easier because all surfaces are smooth—there are no corners to collect dirt and invite corrosion. A complete line of capacities from 15,000 to 2,500,000 gallons lets you select the tank that is best suited to your municipal system. Write our nearest office for information on how your community gets better service when storage is "distributed" in Horton elevated tanks.

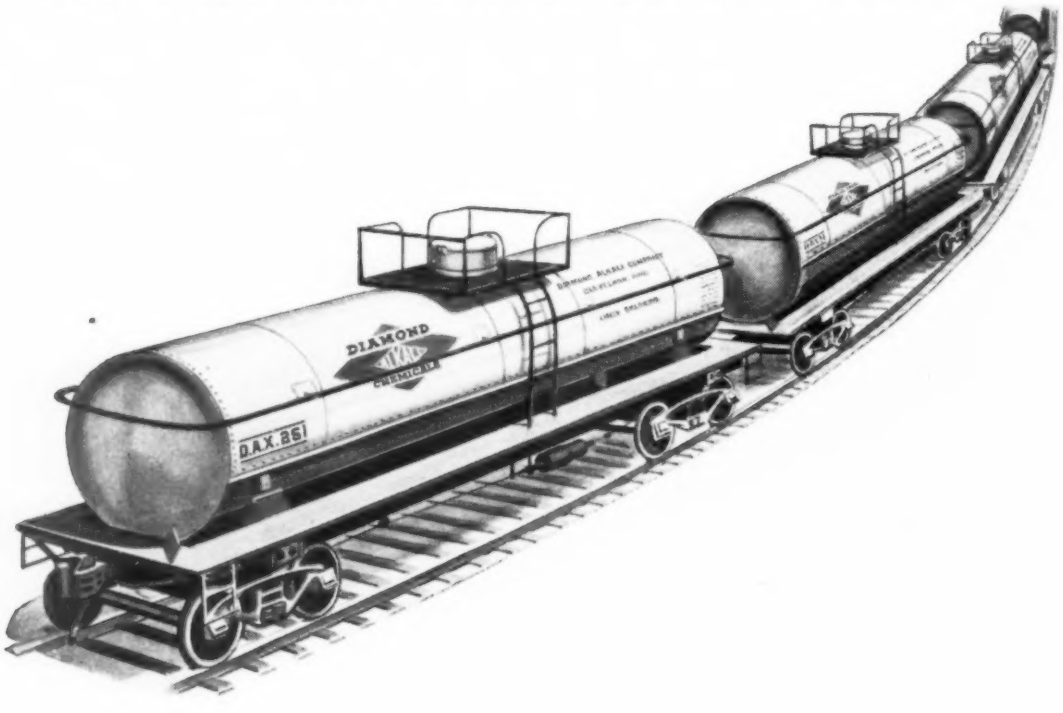
CHICAGO BRIDGE & IRON COMPANY

Atlanta 3	2181 Healey Building	Detroit 26	1551 Lafayette Building	Philadelphia 3	1644—1700 Walnut Street Building
Birmingham 1	1586 North Fiftieth Street	Houston 2	2115 National Standard Building	Salt Lake City 1	1550 First Security Bank Building
Boston 10	1048—201 Devonshire Street	Havana	402 Abreu Building	San Francisco 11	1283—22 Battery Street Building
Chicago 4	2198 McCormick Building	Los Angeles 14	1555 General Petroleum Building	Seattle 1	1350 Henry Building
Cleveland 15	2262 Guildhall Building	New York 6	3390—165 Broadway Building	Tulsa 3	1646 Hunt Building

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

* CHLORINE * SODA ASH
Chemicals you live by
ALKALI SPECIALTIES * SILICATES

TIE ONTO THIS WATER CONDITIONING LINE



Your chlorine needs for water purification can be even more speedily filled now. DIAMOND's new electrochemical plant at Houston is another of its modern plants providing Liquid Chlorine. They are all strategically located for prompt service . . . Edgewood, Maryland; Painesville, Ohio and Houston, Texas.

The centrally located plant at Painesville also furnishes DIAMOND Soda Ash and Alkali Specialties for water softening and equipment protection. DIAMOND Standard Silicates for settling impurities and clarifying water, are produced in six plants.

All in all, DIAMOND ALKALI provides a chain from coast to coast, for quick response to your needs.

DIAMOND CHLORINE

DIAMOND ALKALI COMPANY • CLEVELAND 14, OHIO

DIAMOND ALKALI CHEMICALS

FOR WATER, STEAM, OR GAS LINES *not requiring use of "125-pound" valves . . . Crane recommends 25-Pound Iron Body Double Disc Gates with brass trim. Short and compact; occupy minimum space in pipe lines. Rated at 25 pounds steam; up to 50 pounds cold water. Flanged or hub ends. Sizes: 10-in. and larger. See your new Crane Catalog, p. 90-1.*

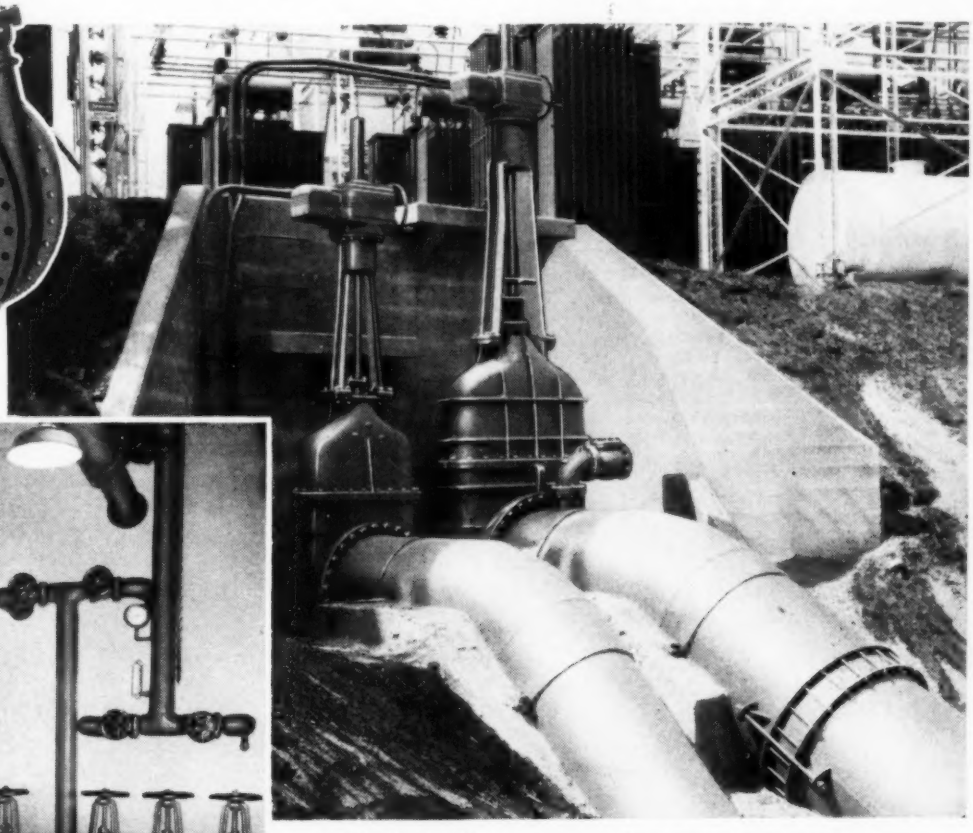
CRANE VALVES

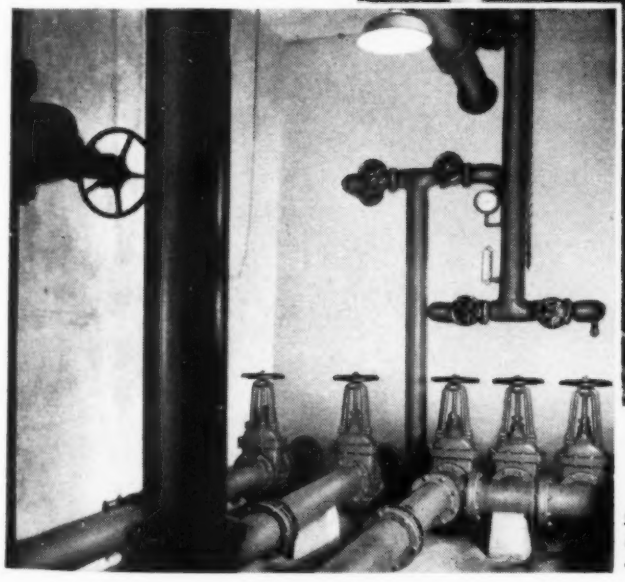
for better water service at lower cost

Can you always count on positive performance from valves in water and sewage services? Those valves used infrequently as well as those operated every day? You can when you equip with Crane. For Crane valves and fittings have a record for efficient performance under all operating conditions that is second to none.

With such a record it is obvious that maintenance, repair, and replacement costs will be held to the minimum. Today as always, Crane Quality in construction and materials is your assurance of valves that give long and dependable duty on any water service.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill., *Nation-wide Service Through Branches and Wholesalers*





WATER SUPPLY LINES *at hydro-electric plant featuring Crane 36-in. and 42-in. motor operated double disc gate valves, check valve and flanged fittings.*

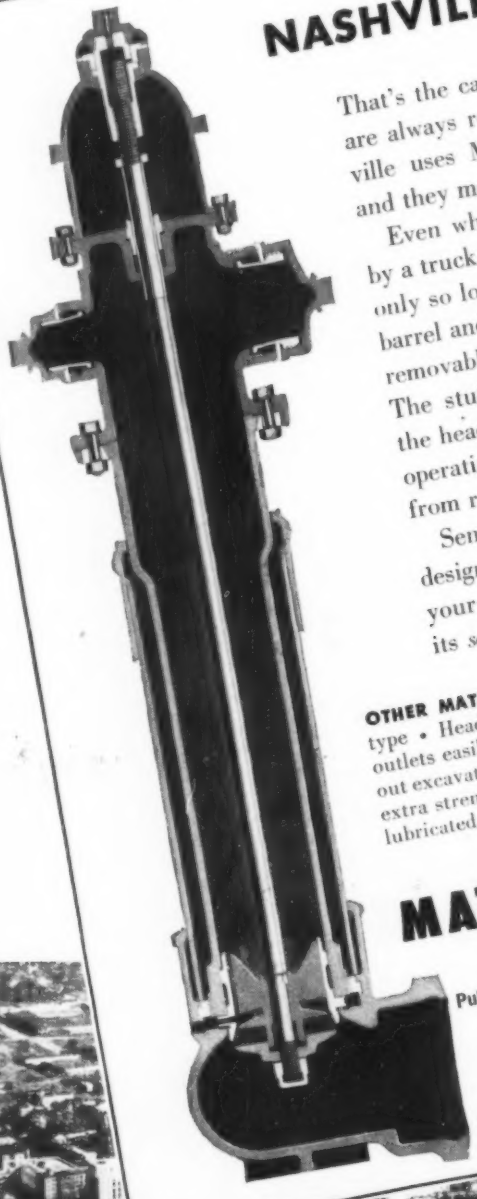
SEWAGE DISPOSAL PLANT *equipped with Crane 200-pound iron body double disc gate valves with cleanout, pipe, flanged fittings and chain wheel operators.*

VALVES · FITTINGS · PIPE

CRANE

PLUMBING AND HEATING

NASHVILLE, TENNESSEE



That's the case when a city's fire hydrants are always ready and fit for service. Nashville uses Mathews Modernized Hydrants and they mean *safety plus.*

Even when a Mathews is knocked down by a truck, the unfit-for-service period lasts only so long as it takes to bring up a spare barrel and install it *without excavating*. The removable barrel contains all working parts. The stuffing box plate, cast integral with the head, prevents water from reaching the operating thread to cause deterioration from rust or sand.

Send for full description of this soundly designed hydrant and see for yourself why your community cannot afford to be without its *safety plus* features.

"One of America's Safest Cities"
THE MATHEWS FIREMEN SAY

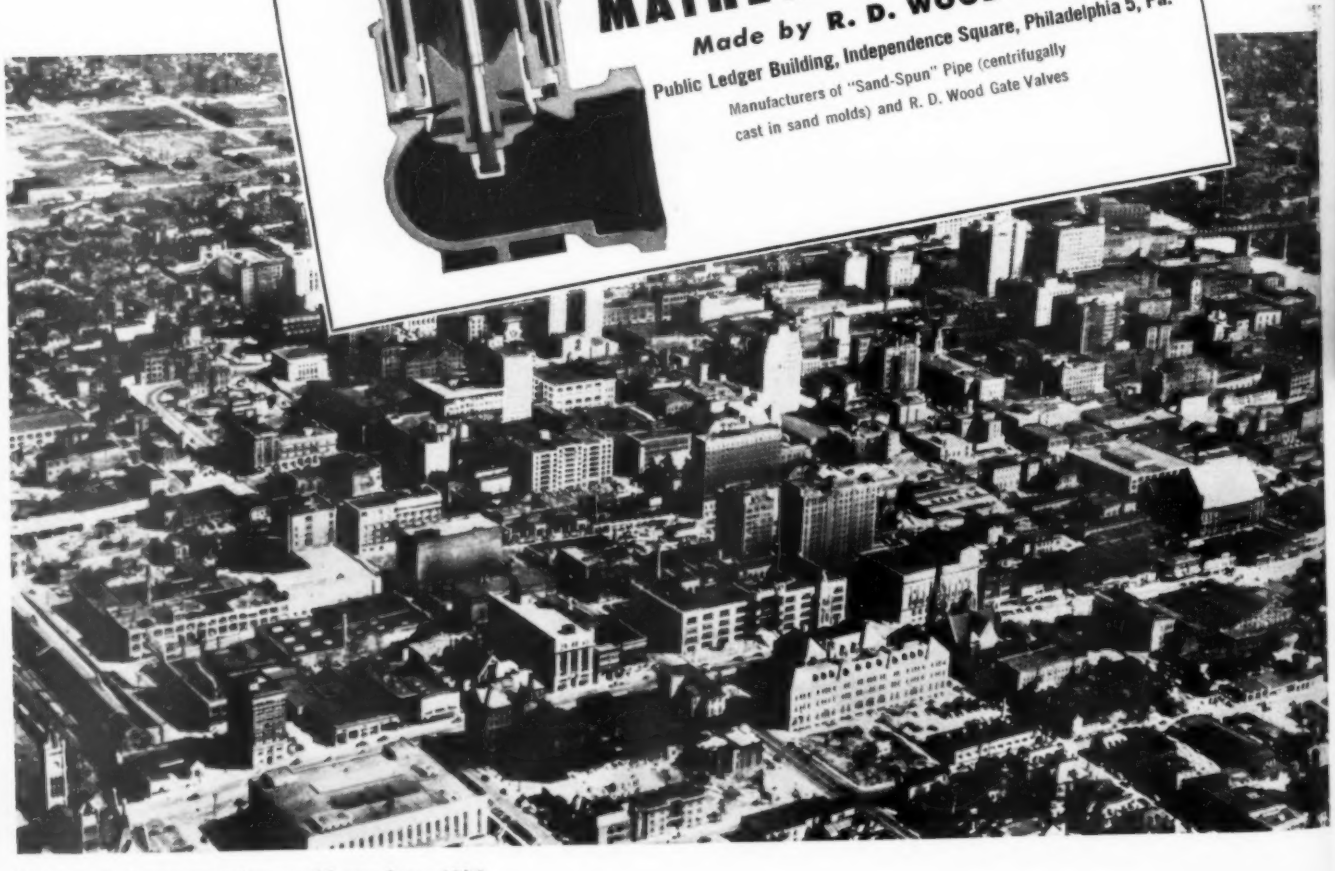
OTHER MATHEWS HYDRANTS: Main valve true compression type • Head can be turned 360° • Replaceable head, nozzle outlets easily changed • Nozzle levels raised or lowered without excavating • Protection case of "Sand-Spun" cast iron for extra strength, elasticity • Operating thread only part to be lubricated • A modern barrel makes any Mathews good as new

MATHEWS HYDRANTS

Made by R. D. WOOD COMPANY

Public Ledger Building, Independence Square, Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves



BEAUTY

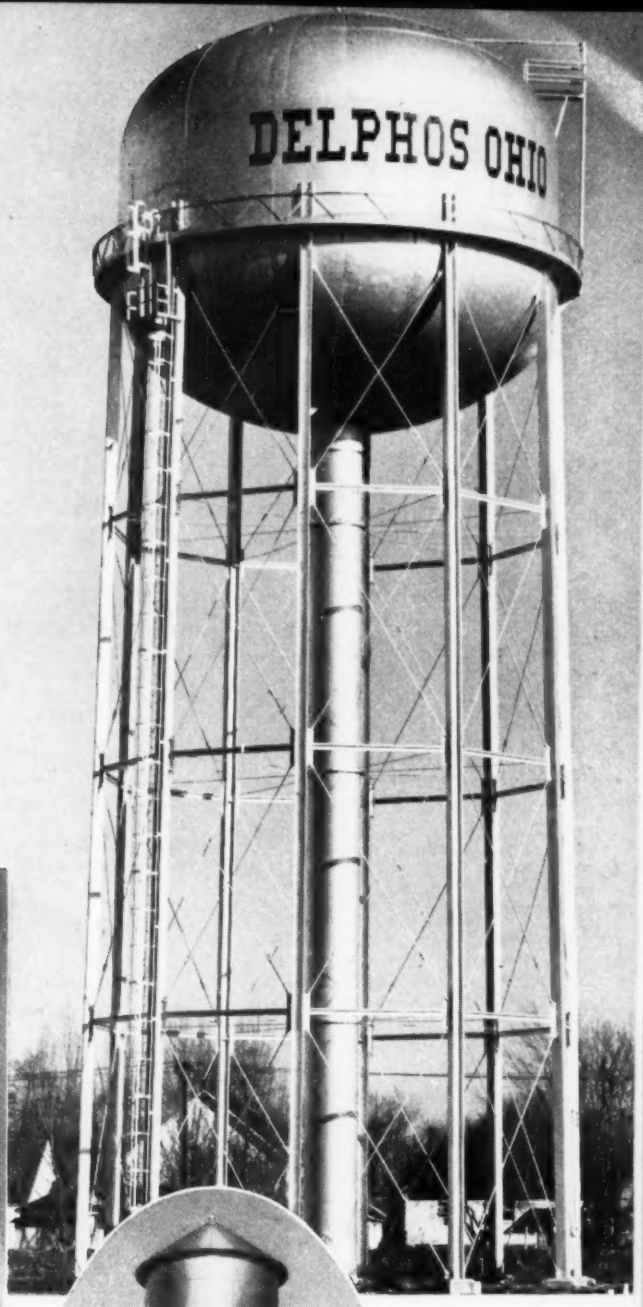
EFFICIENCY

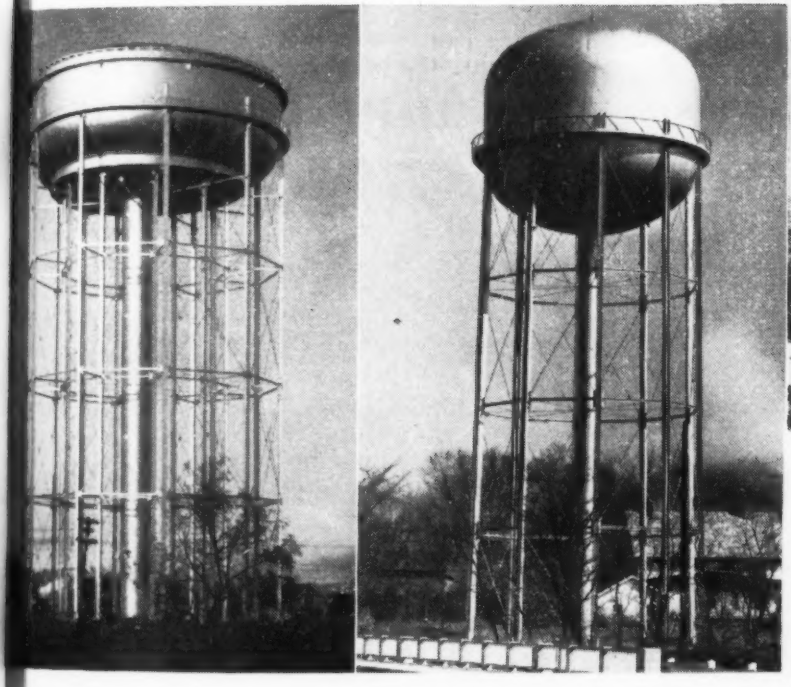
ECONOMY

FOR MUNICIPAL WATER STORAGE REQUIREMENTS

PITTSBURGH • DES MOINES

Elevated Steel Tanks





Match your specific water storage need with the right Pittsburgh-Des Moines Elevated Steel Tank! We will be happy to consult with you at any time, without obligation . . . meanwhile, write today for our comprehensive new Catalog: *informative, clear, complete!*

PITTSBURGH • DES MOINES STEEL CO.

Plants at PITTSBURGH, DES MOINES and SANTA CLARA

Sales Offices at:

PITTSBURGH . . . . . 3418 Neville Island
NEW YORK . . . . . Room 918, 270 Broadway
CHICAGO . . . 1222 First National Bank Bldg.
DES MOINES . . . . . 919 Tuttle St.
DALLAS . . . . . 1223 Praetorian Bldg.
SEATTLE . . . . . 926 Lane Street
SANTA CLARA, CAL. . . . . 625 Alviso Road

COMPARE O. S. C. SEPTIC TANK CLEANING

WITH OLD FASHIONED, UNSANITARY METHODS

When a Sanitary Service Operator puts a new Gorman-Rupp Odorless Sanitary Cleaner on the job these are the results:—

1. A disagreeable job becomes pleasant, easy work.
2. Unsanitary methods and unhealthy conditions eliminated. Septic tank cleaning with an O. S. C. unit complies with or exceeds health regulations and requirements. It banishes open tanks, diaphragm hand pumps, shovels and other makeshift equipment.
3. It does each job more thoroughly, in a fraction of the time previously required. For example, 500 gal. tanks are cleaned in 15 minutes, 1000 gal. tanks in 20 minutes.
4. It offers operators profit possibilities far in excess of income with present equipment and methods.
5. An O. S. C. unit has other profitable uses such as transporting water, emergency fire fighting, sprinkling, dewatering, etc.

Show this to Sanitary Service Operators in your community. For complete information write for Bulletin 7-ST-11.

GORMAN-RUPP'S NEW "MIDGET" 1½" PUMP

FASTEST, self-priming, most efficient pump for general use. Weighs but 62 lbs. -- pumps 5500 GPH -- self-primes up to 30 ft. -- non-clogging, sturdy. Gorman-Rupp builds a complete line of pumps from the "HANDY", delivering 8 GPM, to large capacity pumps which deliver as high as 125,000 GPH.

327 NORTH BOWMAN STREET

THE GORMAN-RUPP COMPANY

MANSFIELD, OHIO

Superior Performance

...of a Superior COAGULANT

TENNESSEE CORPORATION Ferri-Floc FERRIC SULPHATE Atlanta, Georgia

SEVEN ADVANTAGES OF FERRI-FLOC

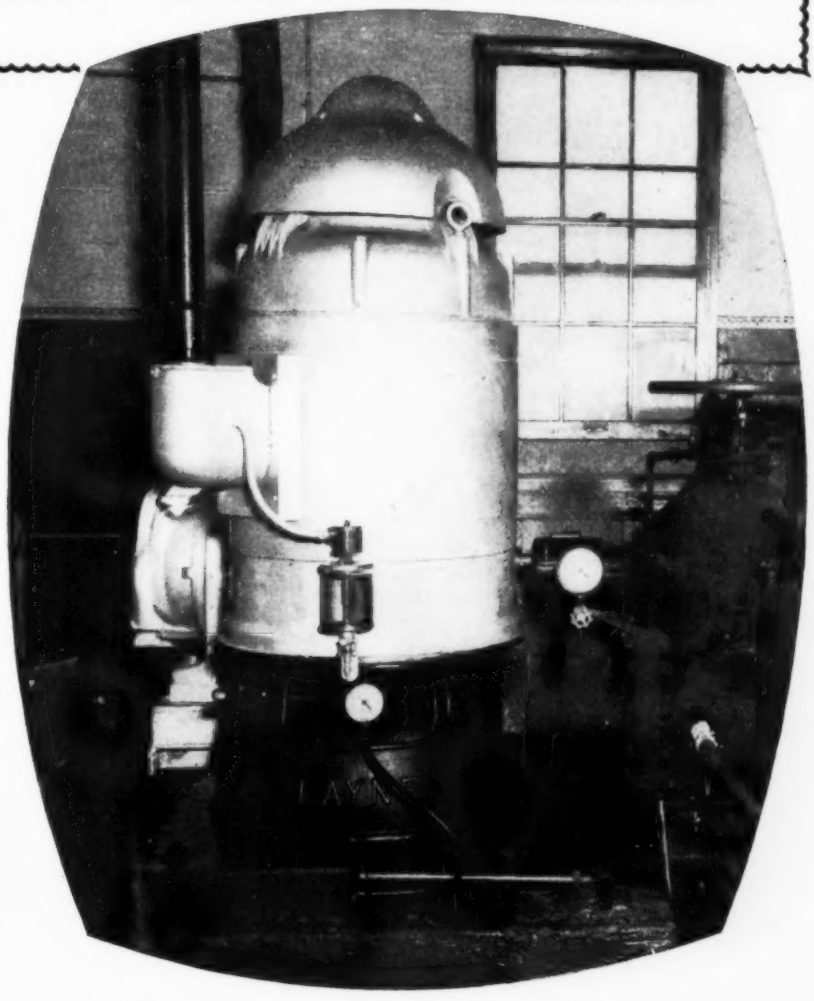
1. Coagulation is effective over a much wider pH range than with other coagulants. Color flocs may be formed in the very acid range where other coagulants may not be employed. On the other hand, true hydrated ferric oxide flocs may be formed at pH 9-10 or even higher for the removal of turpidity and manganese.
2. The time required for floc formation, conditioning and settling is in many cases considerably shorter than that required for other coagulants.
3. Filter runs have been markedly increased in several cases.
4. Manganese is successfully removed at pH values above 9.
5. Effluents may be produced which are exceedingly low in both iron and aluminum.
6. Hydrogen Sulphide is removed and taste and odors improved.
7. Ferri-Floc does not seem to stick to sand grain to form mud balls, and is subject to less "breaking through" on the filters.

Let us send you FREE, this valuable booklet on Ferri-Floc.
Write TENNESSEE CORPORATION,
Grant Bldg., Atlanta, Ga.

Many of the country's larger plants are now recognizing the advantages offered by Ferric Coagulants and are taking advantage of them through Ferri-Floc. — Ferri-Floc eliminates the troubles encountered with other coagulants by improving general quality, reducing overall cost. — All of this is accomplished without costly changes in plant equipment.

TENNESSEE CORPORATION
Atlanta, Georgia — Lockland, Ohio

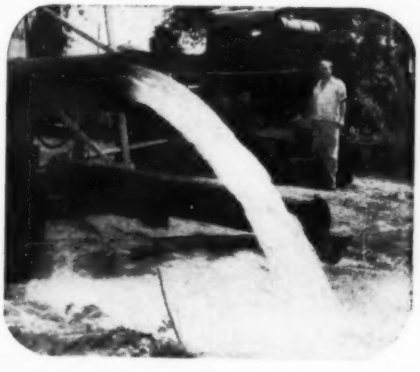
WHAT ABOUT THE WAY THEY ARE INSTALLED



The Layne Method Has Many Advantages

About 98 percent of a well water system is an underground construction project, completely out of sight and inaccessible. Just how good the materials are, or how poor it was built can not be adequately checked by you or anyone in your organization. As for what goes into it, you must depend upon the reputation, integrity and skill of the builder.

First, Layne uses well building methods obtained from nearly three quarters of a century of world-wide experience. And second, everything used: casing, shutter screen, shafting, pump bowls, impellers, bearings, motors and controls are of the very highest quality. Another exceptional advantage is that all Layne well water systems are built to produce greater volumes of water than can be obtained by the conventional type of installation.



For more water at less operational cost, install a Layne Vertical Turbine Pump. Sizes are from 40 to 16,000 gallons per minute. Send for Pump Catalog.

The "Know-How" Counts In Underground Construction

Layne's "know-how" in building the better kind of well water systems assures you of a better job from start to finish. It omits guess work and patch ups in construction errors by the less experienced. After the installation has been completed, tested and accepted, you have the reputation of the long established and highly responsible Layne organization on which you can always depend for service, parts or repairs if and when needed.

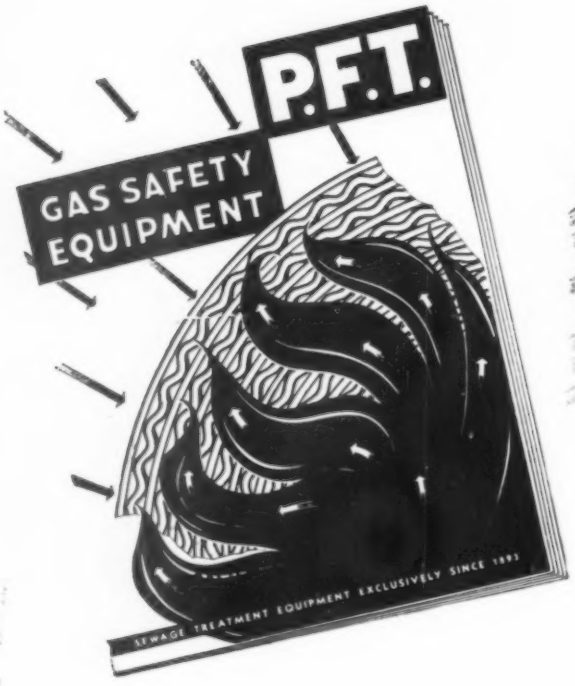
For further information, catalogs, etc., address

LAYNE

LAYNE & BOWLER, INC.
GENERAL OFFICES, MEMPHIS 8, TENN.

WELL WATER SYSTEMS

ASSOCIATED COMPANIES—Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Pacific, Inc., Seattle, Wash. ★ The Layne-Texas Co. Ltd., Houston, Tex. ★ Layne-Western Co., Kansas City, Mo. ★ Layne Minnesota Co., Minneapolis, Minn. ★ International Water Corp., Pittsburgh, Pa. ★ International Water Supply, Ltd., London, Ont. ★ Layne-Hispano Americana, S.A., Mexico, D. F. ★ General Filter Company, Ames, Iowa.

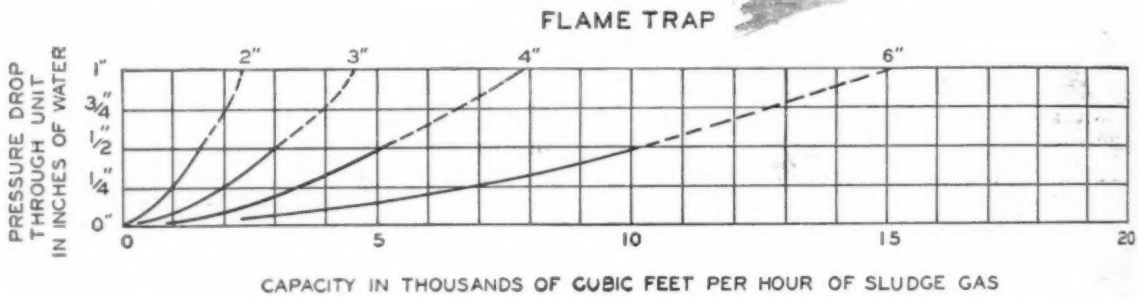


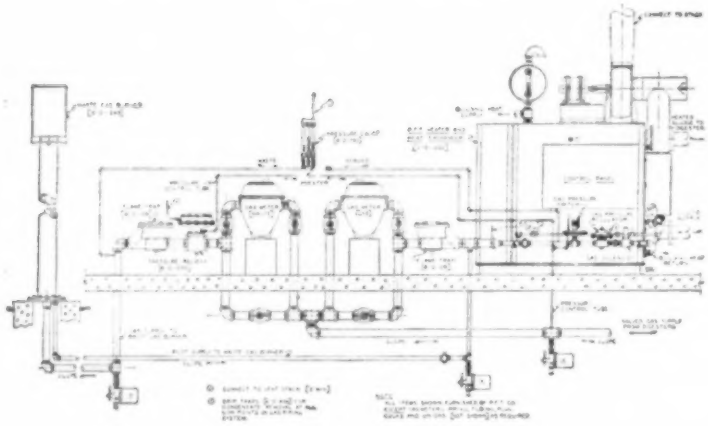
The P.F.T. "How To" of SEWAGE TREATMENT PLANT SAFETY!

Here, under one cover, is the complete story on explosion prevention in sewage treatment plants. Bulletin 221 analyzes the causes of such explosions and shows how carefully engineered P. F. T. equipment provides the utmost in protection. Fully described are P. F. T. Flame Traps, Pressure Reliefs, Waste Gas Burners, Pilot Line Flame Cells, Gas Pressure Indicating Gauges, Pressure Check Valves, Drip Traps, Accumulators.

HOW TO SELECT SIZES

Simple charts and graphs make selecting the right size equipment easy. Below is just one example — an easy to read graph showing clearly just what size of PFT Model 91 Flame Trap is needed for varying quantities of gas.





HOW TO INSTALL

Gas piping arrangements, such as that shown below, and other diagrams drawn from typical plant set-ups, show how all equipment is interconnected and show P. F. T.'s place in the over-all picture. Send for your copy of Bulletin 221 today.

PACIFIC FLUSH TANK CO.

P.F.T.

SEWAGE TREATMENT EQUIPMENT EXCLUSIVELY SINCE 1893

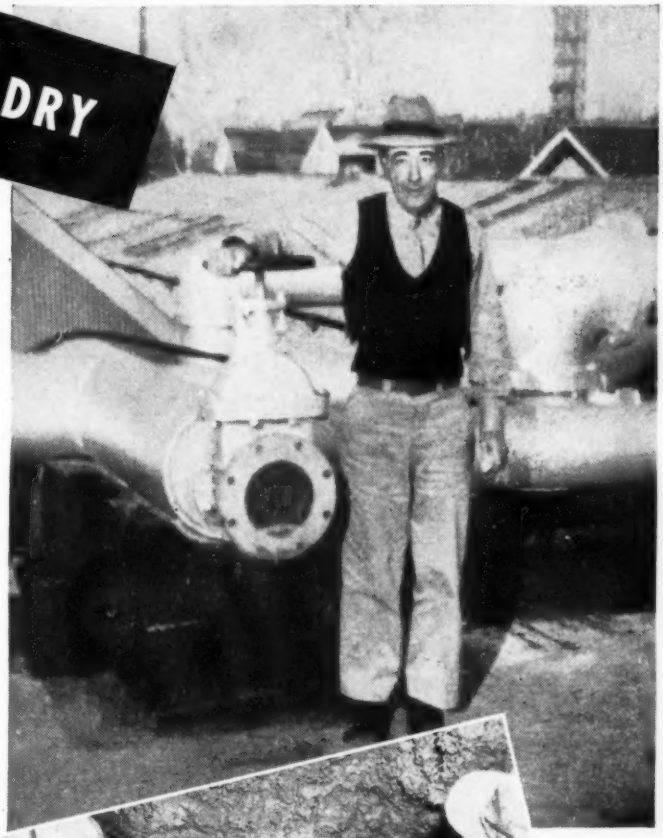
4241 RAVENSWOOD AVENUE CHICAGO 13, ILLINOIS

NEW YORK ● LOS ANGELES ● SAN FRANCISCO ● CHARLOTTE, N. C. ● DENVER ● TORONTO

Read what this superintendent did about

THE LINE THAT WENT DRY

Supt. S. L. Perry stands by open valve at the city end of 6-mile Alexandria, La., water line. The 400,000 gallons pumped daily did not reach the city plant.

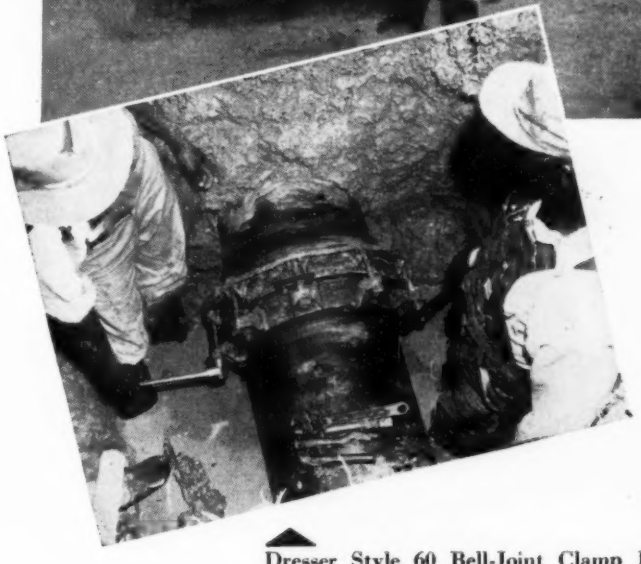


"The city was not only without water for proper sanitation, but was without adequate fire protection." So says Supt. S. L. Perry of Alexandria, La., in his article in January, '48, WATER WORKS ENGINEERING. Vibration from a near-by highway and railroad had caused every one of the 1500 bell joints in the city's new 6-mile, 16-inch water line to leak to such an extent that no water was reaching the city end of the line. Unstable ground and quicksand complicated the repair problem.

Mr. Perry called on Dresser for help. The first shipment of Dresser Style 60 Bell-Joint Clamps was on its way the day the order was received, and a factory representative went along to make sure the crews had the few simple instructions for correct installation of the clamps.

Mr. Perry makes these further comments:

"Two men, working with ratchet wrenches, assembled the clamp, and adjusted it snugly to the joint. Actual clamp installation time rarely exceeded ten to fifteen minutes. It was well that additional time was not required in the quicksand area, as that was about as long as a man could keep his footing. . . . We feel that we now have tight joints and ample insurance against the tremendous vibration set up on either side of the line. A reliable water supply is assured the city for years to come."



Dresser Style 60 Bell-Joint Clamp being installed on one of the 1500 leaking bell joints in Alexandria's 6-mile, 16" O. D. water line.

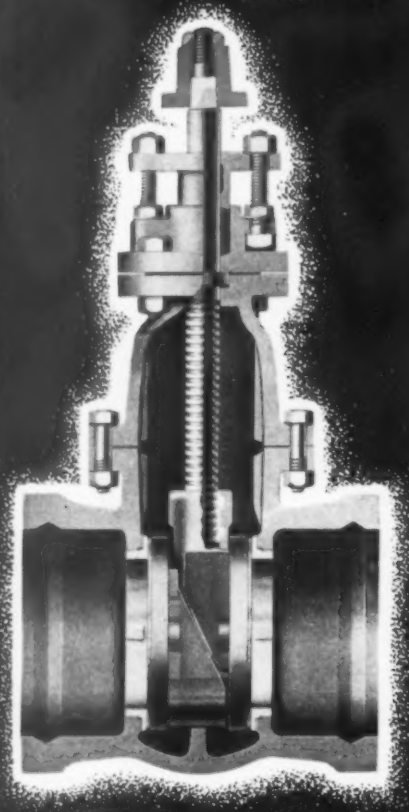
● Leaks near railroads and highways are common. That's why engineers, superintendents and foremen all over the country accept Dresser Bell-Joint Clamps as the most effective seal against leaks. Easy to install under any conditions, always reliably tight, Dressers provide dependable, *permanent* repairs.

Sizes 3" to 60" CIP.

DRESSER BELL-JOINT CLAMPS

Dresser Manufacturing Division (One of the Dresser Industries), 59 Fisher Ave., Bradford, Pennsylvania. In Texas: 1121 Rothwell St., Houston • In Canada: Dresser Mfg. Co., Ltd., Toronto • Sales Offices: New York, Chicago, Houston, San Francisco.

How Darling features prevent trouble and expense



EXTREME SIMPLICITY

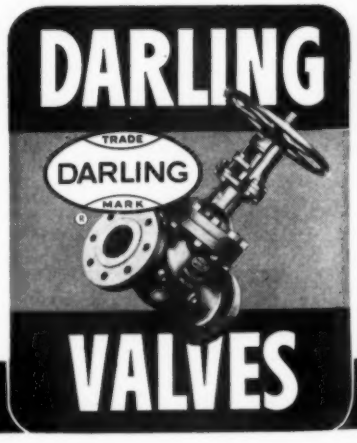
THAT'S all there are—just four simple, sturdy parts—two plain interchangeable no-pocket discs and two husky wedges.

Note particularly that the discs are completely free of pockets. Sediment and scale cannot collect to interfere with their free movement. No links or other devices are needed to hold the discs and wedges together. Any part can be quickly and inexpensively replaced without removing valves from the line. Parts cannot be incorrectly assembled nor become disengaged while in service. Operation and maintenance are equally simple.

Darling valve users are money ahead because of the exceptional service made possible by the ingenious simplicity of the Darling design. These advances, coupled with Darling's modern precision manufacturing methods and advanced metallurgical practice, offer you valve performance at its finest . . . and at the lowest cost. Next time give Darling a try!

DARLING VALVE & MANUFACTURING CO.
WILLIAMSPORT 11, PA.

Outline your service requirements and get complete *information on Darling Valves of the proper type. Or, send for the complete 300-page Darling Catalog No. 17M. It describes Darling Valves of* all *types for* every *normal or unusual service, and for pressures up to 1500 pounds. It's full of helpful information . . . Yours for the asking.*



This advertisement is one of a series showing how the unique Darling Fully Revolving Double Disc Parallel Seat Gate Valves answer the following critical operating problems:

- *Positive, easy closing—regardless.*
- *Automatic adjustment for valve body distortion.*
- *Elimination of disc-to-seat friction and galling.*
- *Uniform wear distribution.*
- *Extreme simplicity.*
- *Greater service life.*
- *Simplified maintenance.*

CORROSION RESISTANT VALVES

In addition to conventional iron, bronze and steel constructions, Darling specializes in valves for any corrosive fluid: iron body valves with special alloy trim; iron body, rubber lined, with special alloy trim; all bronze; and all special alloy. Darling's 50 years of experience in meeting unusual requirements is always at your service.

THE VALVE MARK OF QUALITY . . . WATCH FOR IT

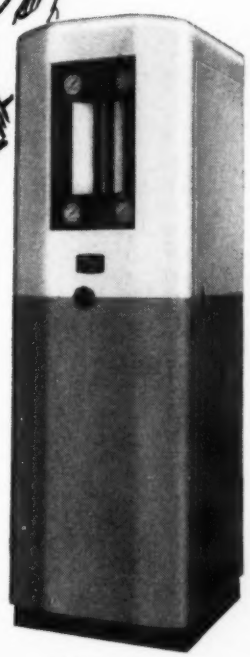
ACCURATE • SAFE • SIMPLE • DEPENDABLE • ATTRACTIVE

BUILDERS *Chlorinizers*

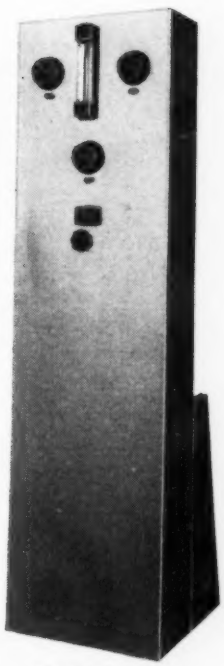
CHLORINE GAS FEEDERS

VOLUMETRIC — SOLUTION FEED
VACUUM TYPE

Builders Chlorinizers are thoroughly field-tested products of Builders-Providence, Inc., a company that has specialized in equipment for metering and controlling flow for more than fifty-five years, and with whom excellence in design and manufacture has been a tradition since 1820. For full information and descriptive bulletins, address Builders-Providence, Inc. (Division of Builders Iron Foundry), Providence 1, R. I.



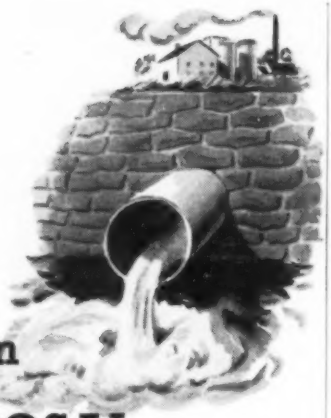
MODEL CVS



MODEL DVS

BUILDERS PROVIDENCE
Instruments

How to beat a legal "threat" on WASTE DISPOSAL



With State after State now imposing legal restrictions on industrial waste disposal, you may be faced with this problem quite suddenly. Only by starting to gather complete data now can you be prepared for necessary action when the time comes.

Foxboro has prepared a concise, informative bulletin on how to conduct a waste disposal survey. Based on specialized knowledge and long experience in the field, this bulletin outlines the simple steps you can take now to gather necessary data on quantities, concentrations, and constituents. Send for a copy of "Waste Disposal Surveys", the first bulletin in Foxboro's series on Industrial Waste Disposal. Write **The Foxboro Company, 228 Neponset Avenue, Foxboro, Mass., U. S. A.**

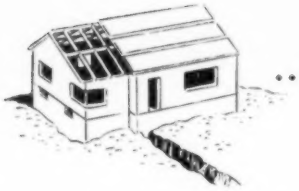
TYPICAL FOXBORO INSTRUMENTS THAT LEAD TO BETTER WASTE DISPOSAL

The Model 40 . . . "the finest modern controller" . . . is the foundation of many outstanding Foxboro Waste Disposal Systems. It is used for the control of flow, pH, conductivity, temperature and other variables. Thousands are in use daily.

Foxboro Float and Cable Type Instruments are specifically designed for use on weirs and Parshall flumes. They read directly in flow.

FOXBORO Instrumentation

INDICATING · RECORDING · CONTROLLING



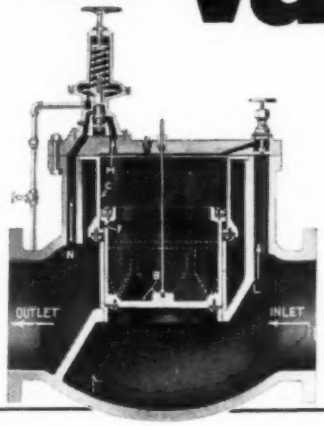
. . . as the Service Lines are extended to new Community Developments . . .

Get the **SAFETY PROTECTION OF**

Golden-Anderson

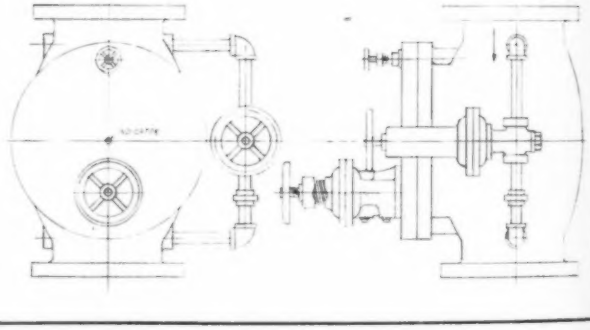
WATER PRESSURE REDUCING

Valves



G-A Water Pressure Reducing Valve, Base Pilot Pattern. These valves are furnished in cast iron, semi-steel and cast steel. Sizes 2" and smaller generally are built with screwed instead of flanged ends.

G-A Pressure Reducing Valve arranged with a By-Passing Reducing Valve to service minimum demands, and a Reserve Main Reducing Valve for maximum demands.



G-A Water Pressure Reducing Valves maintain any desired constant delivery-downstream pressure against a higher inlet head. They also operate sensitively to avoid an excess rise of downstream pressure under any sudden varying flow condition.

Our Engineers

. . . will design and develop automatic flow control valves to solve your particular service problem May we send you further details?

GOLDEN-ANDERSON *Valve* Specialty Company

PITTSBURGH 22, PA.

LIFE AND PROPERTY PROTECTION VALVES SINCE 1905

SECOND OF A SERIES COVERING

The Facts About Activated Alum

*Acid-treated insolubles weight the floc—give faster settling.

*High alumina content.

*Used and preferred by 274 municipalities and industries for over 14 years.

*No interruption to shipments since it was first introduced.

Activated Alum Sales Corp.
516 North Charles Street
Baltimore 1, Maryland

BLAW-KNOX GRATING

FOR SAFE FOOTING

This one-piece electroforged steel "material" is furnished to your specifications—cut to fit any shape or area. Installation is quick and sure—requiring only simple clips supplied with order . . . Safe footing at all times is assured by twisted cross bars . . . Admits maximum amount of light and air . . . Only maintenance is an occasional coat of paint . . . For safety's sake, mark your grating specs—"Blaw-Knox".

BLAW-KNOX DIVISION
of Blaw-Knox Company
2051 Farmers Bank Bldg.
Pittsburgh 22, Pa.

Lays Fastest—Lasts Longest!

McWane PRECALKED joints are ready to use. Pure lead and redwood wedges are carefully put in the bells at the McWane Plant. No expensive equipment or skilled labor is necessary. Just a man with a hammer and a calking tool are all you need to lay McWane PRECALKED Pipe as fast as the trench is dug!

PROMPT SHIPMENT
4" and Larger Sizes

ALL SIZES 2" thru 12"

McWANE CAST IRON PIPE CO.
Birmingham 2, Alabama

HOW TO

keep out of the pavement breaking business!

. . . . . .

from a 2' 6" by 7' 6" trench Hydrauger BORES a straight open 200' long hole. Bore diameters — 2" through 24".

The BETTER WAY to install short runs of PIPE

FREE BULLETIN!

HYDRAUGER CORP., Ltd.
681 Market St., San Francisco 5, Calif.

Without obligation, please send me a copy of Hydrauger Bulletin which shows the low costs and high speeds of the Hydrauger.

*Name*_____
*Address*_____
*Company*_____ *State*_____
*City*_____

HY-21A

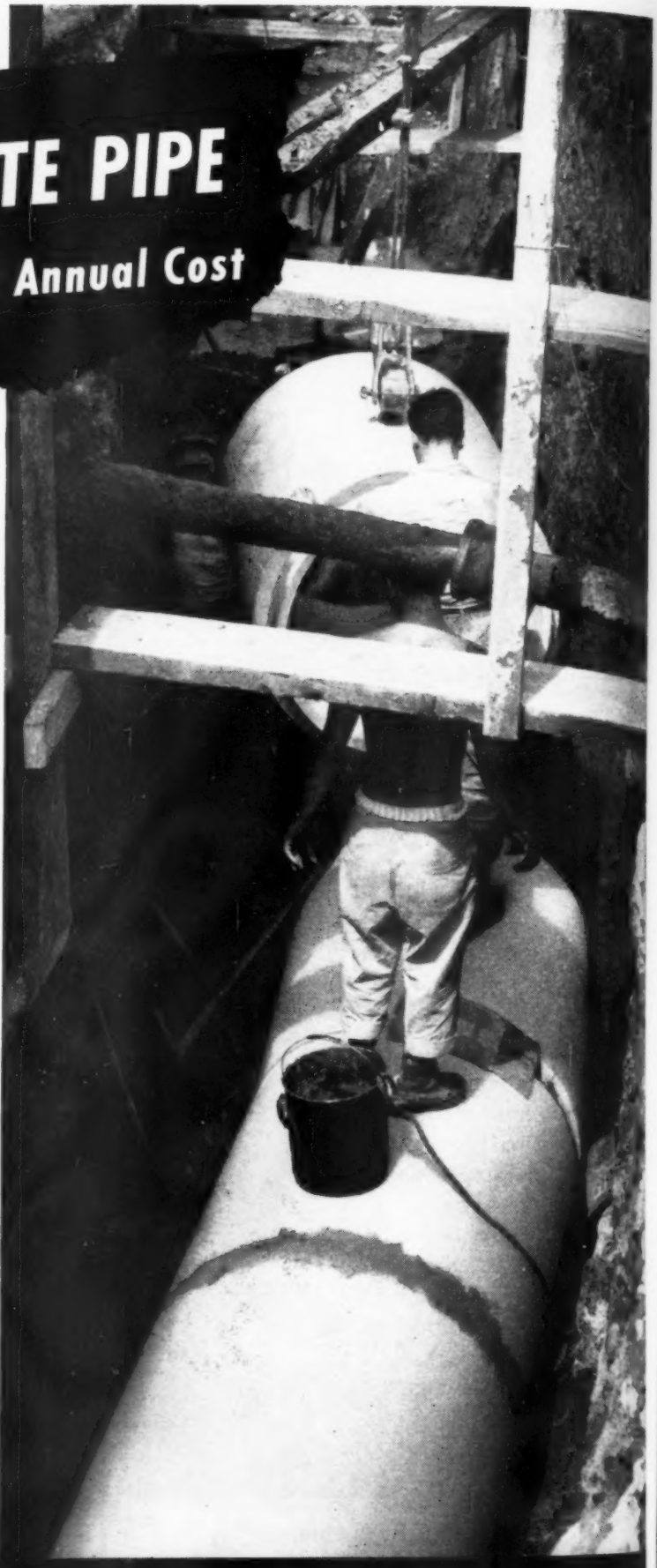
HYDRAUGER*

Earth Boring Tool

**Reg. U. S. Pat. Off.*

Specify CONCRETE PIPE

for Long Service at Low Annual Cost



FROM coast to coast leading sanitary engineers specify concrete pipe for sewer lines because it meets all essentials of long, dependable, economical sewerage service:

1. **Ample strength** to resist severe impact and to sustain heavy overburdens.
2. **Maximum carrying capacity** and high **wear resistance** to abrasion caused by suspended matter in high velocity flow because of its smooth interior finish and clean, even joints.
3. **Minimum infiltration and leakage** because of tight joints and uniformly dense concrete.
4. **Durability** to render long years of heavy-duty service. This means real ***low-annual-cost*** economy.

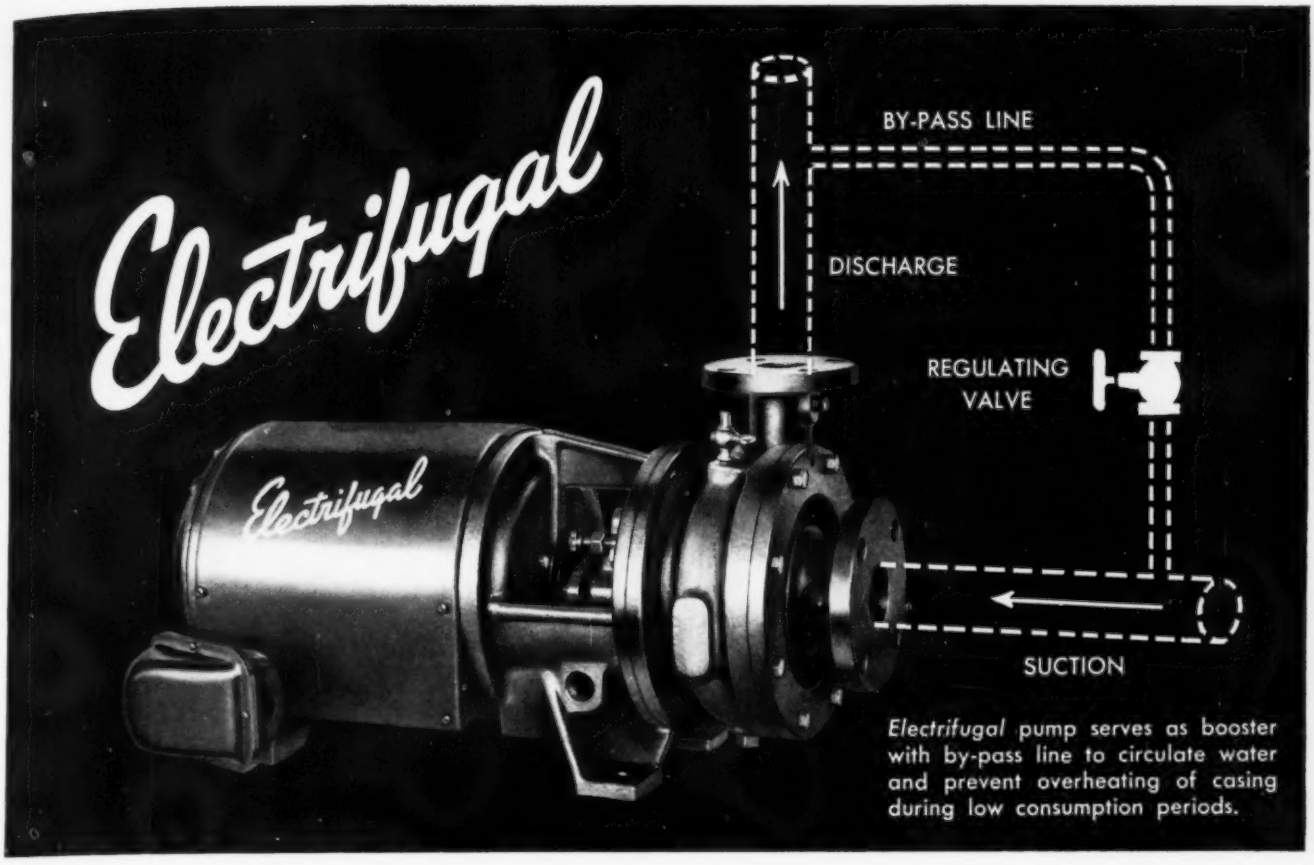
Concrete pipe lines for drainage, sanitary sewers and waterlines have demonstrated their superiority in thousands of installations all over America. Many of these lines have served under the hardest usage for half a century and more.

Concrete pipe serves economically because of its moderate first cost, long life and low upkeep. These factors guarantee ***low-annual-cost*** service—the true measure of pipe line economy.

Sanitary sewer being laid in Ridgewood, N.J., a suburban community of 15,000 near New York City.

AMERICAN CONCRETE PIPE ASSOCIATION

228 NORTH LA SALLE STREET, CHICAGO 1, ILLINOIS



Electrifugal pump serves as booster with by-pass line to circulate water and prevent overheating of casing during low consumption periods.

Boost Pressures

ON UNDERSIZE MUNICIPAL PIPE LINES!

- *Electrifugal pumps do the job dependably and inexpensively*
- *You escape heavy construction costs of replacing old lines*
- *Complaints from users in low pressure areas are eliminated*

EXPANDING residential areas often suffer from low water pressures due to undersize pipe lines. Replacement means interrupted service and costly construction. An alternate solution — used by many cities — is to install *Electrifugal* pumps as boosters.

In an outlying district of one city, up to 50 homes are serviced on a two-inch line using the method diagramed above. The *Electrifugal* pump constantly maintained normal pressure during both high and low consumption periods.

Because the cast iron yoke and bracket for mounting are designed as a single piece, separate adapters are eliminated. And because motor and pump are on a single shaft, perfect alignment is assured and maintenance costs are negligible.

Your nearest A-C representative would be glad to discuss your pumping problems. Why not call him? For more details, send the coupon today.

Electrifugal is an Allis-Chalmers trademark.

ALLIS-CHALMERS

Builders of the World's Widest Line of Major Public Works Equipment

Mail Coupon Today

ALLIS-CHALMERS, 1192A SO. 70 ST. MILWAUKEE, WIS.

I am interested in knowing more about *Electrifugal* pumps and how they can economically solve problems of boosting water pressures in undersize pipe lines.

☐ **Please have an Allis-Chalmers representative call.**

☐ **Please send me bulletin 52B6059E, "*Electrifugal Pumps*".**

Your Name _____

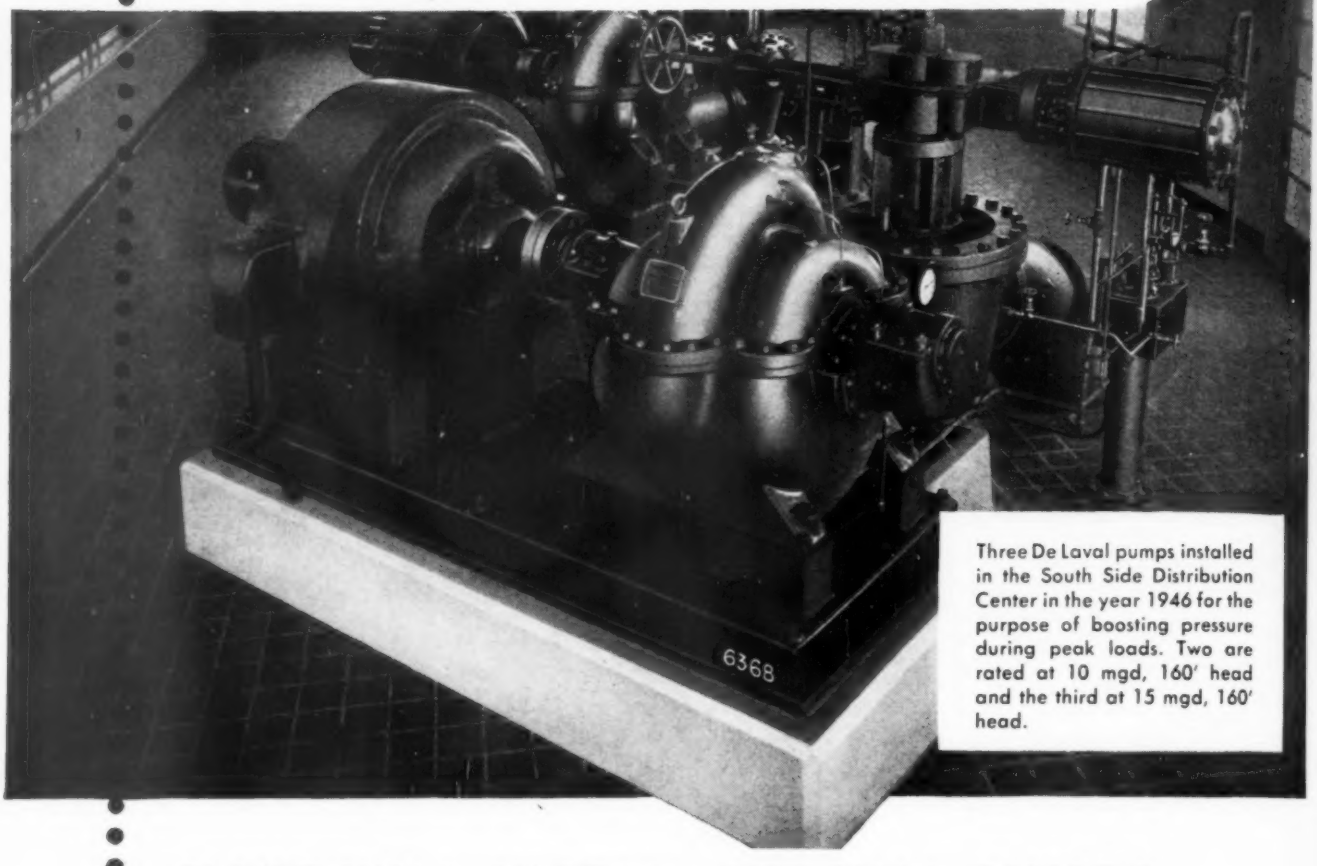
Position _____

Address _____

City _____ State _____

A-2855

FOR THE 7th TIME



Three De Laval pumps installed in the South Side Distribution Center in the year 1946 for the purpose of boosting pressure during peak loads. Two are rated at 10 mgd, 160' head and the third at 15 mgd, 160' head.

FLINT WILL INSTALL DE LAVAL PUMPS

to meet increased water demands

Seven times in a row . . . 1918, 1921, 1923, 1924, 1930, 1946, and now in 1949 the City of Flint, Michigan will install De Laval pumps to satisfy an ever inceasing demand for water. Four low lift and two high lift pumps will be installed in Pumping Station No. 3 later this year and they will give the City of Flint a total capacity of 352 mgd . . . all handled by De Laval pumps.

Here, as in over 78 per cent of America's cities, De Laval pumps have insured complete dependability and high sustained efficiency, year after year. When you are ready to install additional pumping capacity, specify DE LAVAL.

SEND FOR CATALOG 10-8-WS

DE LAVAL

DE LAVAL STEAM TURBINE CO., TRENTON 2, N.J.

TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS

ERS WROUGHT IRON PIPE

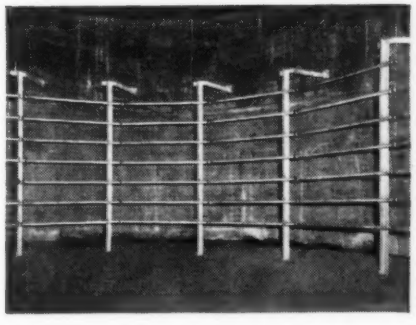
In the attractively landscaped sewage treatment facilities of the Aurora (Illinois) Sanitary District, the designers used a proven means of avoiding maintenance difficulties in the sludge digester tanks. The heating coils were fabricated of Byers Wrought Iron—an engineering favorite for this important and punishing service.

In this application, the natural corrosive properties of the sludge are aggravated by the heating; authorities have estimated that the corrosion rate doubles for each 20° F increase in temperature. Furthermore, sludge tends to collect on the surface of the heating coils, where it decomposes and liberates very aggressive compounds.

Obviously, the only safeguard against premature failure and excessive repairs is to use a corrosion-resistive material. As a review of the specifications of modern plants will show, wrought iron has been utilized in a large number of installations. This widespread and continued use is the best index of its durability and dependability.

There's a definite reason why wrought iron stands up longer in severe services like this. The tiny fibers of glass-like silicate slag, threaded through the body of high-purity iron, halt and diffuse corrosive attack. This discourages the pitting and penetration that causes vulnerable materials to fail. These fibers also anchor the initial protective scale, which shields the underlying metal—just as a scab protects a wound.

If you are concerned with the design of a new plant, or with the maintenance of an existing plant, you will find some helpful information in our bulletin, WROUGHT IRON FOR SEWAGE TREATMENT AND DISPOSAL INSTALLATIONS. It illustrates and describes many of the more than fifty applications where wrought iron is successfully serving in modern plants. May we send you a copy?

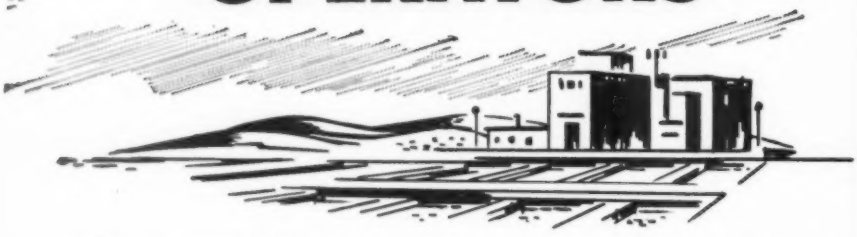


Typical installation of Byers Wrought Iron pipe in heating coils of a sludge digestion tank.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, Seattle, San Francisco. Export Division: New York, N. Y.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

Important FACTS ABOUT pH for WATER & SEWAGE OPERATORS



WHETHER YOU ARE building a new plant or modernizing present equipment, one of the most important advancements you can make in either water or sewage plants is the installation of BECKMAN pH CONTROL. Through the magic of proper pH control you can make *many* vital savings . . . savings that will quickly pay for the installation and will *continue* paying big dividends throughout the years. For example, some of the many benefits resulting from Beckman pH Control include . . .

WATER PLANTS: Maximum coagulation in settling basins . . . better control of chemicals and treatment during lime-softening operations . . . accurate control over alkalinity of finished water after recarbonation . . . reduction of corrosion in mains and pipe lines . . . and many other important savings.

SEWAGE PLANTS: Optimum sludge digestion . . . more efficient sludge filtration . . . better coagulation . . . accurate control over fluids discharged into rivers and lakes . . . and other vital savings in operating costs.

BUT TO MAKE CERTAIN you get the latest, most convenient and most accurate pH equipment available, *be sure to specify* "BECKMAN" . . .

✱ Beckman pH equipment is completely electrometric, eliminating the mess and inaccuracies of colorimetric methods. Simply press a button and the exact pH of any process is instantly shown on a large easily-read dial. *It is the simplest of all pH methods!*

✱ The accuracy of Beckman pH readings is completely unaffected by human errors in color judgment, by turbidity, oxidizing or reducing agents, by suspended materials, colored process solutions or other variables that affect outmoded colorimetric methods. *Beckman pH readings are universally accurate and dependable!*

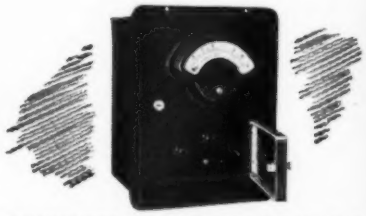
✱ With Beckman equipment no time-wasting or troublesome sampling devices are needed. Beckman pH electrodes may be installed directly in vats, tanks, channels or flow lines—and exact pH values read instantly—and continuously, if desired—on the process fluids themselves.

✱ Unique rugged-type Beckman Electrodes, specially designed for direct immersion in abrasive or suspension-laden fluids, reduce maintenance to an absolute minimum. *Beckman is the most trouble-free of all pH equipment!*

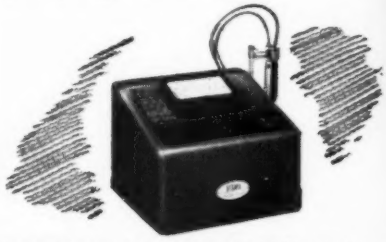
The above are only a few of many Beckman advantages. Write for the complete story.

Write for special Water and Sewage Bulletin! A special Beckman Bulletin has recently been published outlining various pH applications and methods used in modern water and sewage operations. A free copy of this informative and helpful booklet will gladly be sent on request. Ask for Bulletin 180A!

THERE'S A BECKMAN pH INSTRUMENT FOR EVERY NEED



COMPLETELY AUTOMATIC! The Beckman Model R instrument operates directly from standard 110 v. A.C. lines to provide completely automatic pH indication. Also provides for completely automatic pH recording and automatic process control. Can be installed to give accurate pH readings from various stations in plant through one instrument. *This is the pH unit being installed by today's most modern plants, large and small.*



PORTABLE A.C. OPERATION! The Beckman Model H instrument can be quickly moved from one part of the plant to another and plugs directly into standard 110 v. 50/60 cycle A.C. current. Compact, convenient and extremely simple to operate, the Model H gives instant pH readings on an easily-read dial. It is widely used both for manual pH control of small plants and as an auxiliary instrument on completely automatic pH installations.

COMPLETELY SELF-CONTAINED! The Beckman Model M is the ideal pH instrument where *complete* portability is desired. Operating from its own self-contained, long-life power supply, the Model M can be used *anywhere* in the plant or field, whether convenient to power lines or not. Features the same accuracy, simplicity and operating speed as the Model H, and is also widely used both for manual pH control of small plants and as auxiliary equipment on large automatic installations.

Write for literature on Beckman pH Equipment!

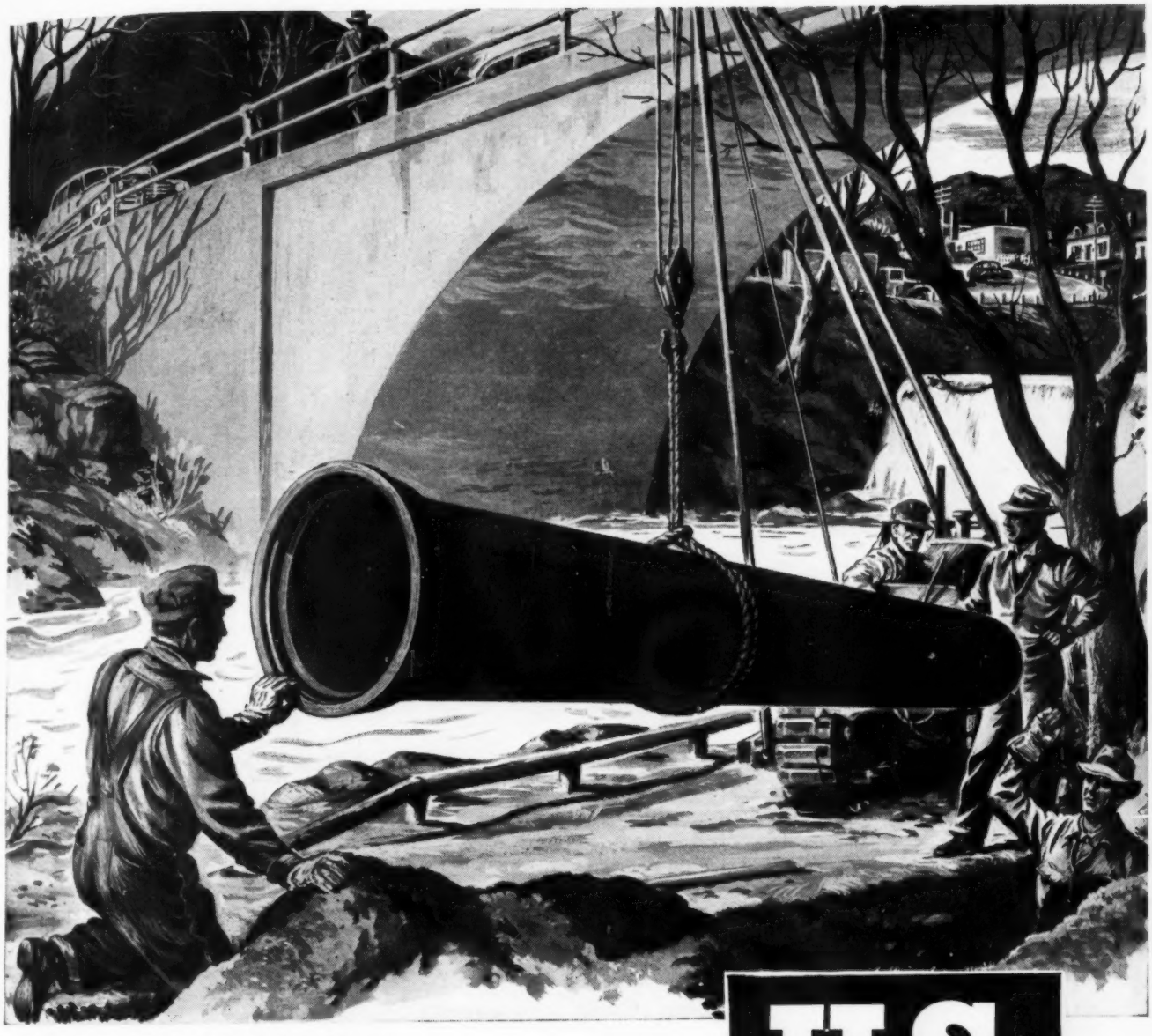
BRING YOUR pH PROBLEM TO US. Our trained engineers will gladly study your problem and recommend the equipment best suited to your particular requirements. No obligation, of course.

BECKMAN

BECKMAN INSTRUMENTS

National Technical Laboratories • South Pasadena 20, California

INSTRUMENTS CONTROL MODERN INDUSTRIES



Painted for U. S. Pipe & Foundry Co. by Paul Laune

U.S. PIPE

THERE are two basic reasons for the uniform high quality of U. S. Super-deLavaud Cast Iron Pipe. Uniformity is obtained by centrifugal casting in permanent metal molds—uniformity in metal structure, in wall thickness and in concentricity. Quality is maintained by scientific controls based on production and process research. To augment the activities of our Research and Development Department toward developing higher obtainable standards of quality we have recently completed a new Headquarters Research and Foundry Laboratory, one of the largest and finest in the Cast Iron Pressure Pipe Industry. **United States Pipe and Foundry Co., General Offices: Burlington, New Jersey, Plants and Sales Offices Throughout U. S. A.**

Why send for the Plumber?

LET IT DRIP...

IT COSTS money to have a plumber repair leaking faucets and toilet bowls — so it's natural for consumers to ignore small leaks for which they pay nothing.

But when you install a system of regular meter inspection, test and repair, so that your meters will register at least 98% at ¼ gallon per minute, the average consumer will pay a plumber to fix the leaks, rather than pay higher water bills.

In this way, water waste is curbed; and in those cases where leaks are allowed to continue, additional revenue is obtained for water which otherwise would have gone unaccounted-for. Your experienced Trident Representative will be glad to help you start a meter testing and repair program.

Trident®
Water Meters

208

Trident is a Neptune Meter Company Trademark

NEPTUNE METER COMPANY • 50 West 50th Street • NEW YORK 20, N.Y
Branch Offices in Chicago, San Francisco, Los Angeles, Portland, Ore., Denver, Dallas, Kansas City, Louisville, Atlanta, Boston.
NEPTUNE METERS, LTD., Long Branch, Ont., Canada

Experienced repair-men like the Trident meter because its simplicity makes it easier to repair. They are the best judges of meter values . . . ask them.

WATER & SEWAGE WORKS

Vol. 96. No. 11 **NOVEMBER, 1949**

A Gillette Publication

N.E.W.W.A. 68th ANNUAL CONVENTION

Large Attendance at Dixville Notch Meeting

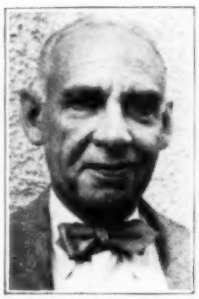
Presidents

Retiring	Incoming
Arthur C. King	*Sidney S. Anthony*
Supt. of Water	*Supt. of Water*
Taunton, Mass.	*Augusta, Me.*

AMID the grandeur of the White Mountains of northern New Hampshire, the sixty-eighth meeting of the New England Water Works Assn. was held on Sept. 13-16. For the meeting the association had the entire facilities of The Balsams, located on Lake Gloriette at Dixville Notch.

With a mountain as a backdrop for the hotel, and the moon rising through the Notch on the night of arrival, guests with a feeling for the beauties of nature could find no disappointment, despite the inclement weather which followed. Whether one ate in the huge dining room with its ample quantity of delicious foods, or at the Club House overlooking the golf course high atop a nearby mountain, there was the ever present breath-taking lovely view to enhance the meal.

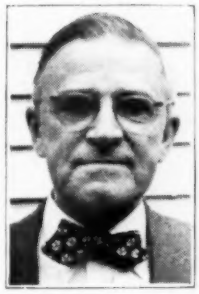
Although the weather interrupted some of the planned out-of-door activities, and postponed some golfing matches and exhibitions, etc., there was always something to do, including a schedule of good technical papers, a full complement of 26 manufacturers' exhibits, two movies in the hotel theater, an "Elsa Maxwell Party," a costume ball, a dinner as guests of the Manufacturers' Assn., entertainment, dancing, ping pong, tennis, golf, shuffleboard, and putting contests.



Secy. and Treas.

Jos. C. Knox	*Wm. P. Melley*
State Dept. Hlth.	*Supt. of Water*
Boston, Mass.	*Milton, Mass.*

In spite of the fact that The Balsams is 58 miles from the nearest railroad station, and almost an all day trip from anywhere, the attendance was highly gratifying to the officers and convention committee of the association. Four hundred and eighty-one persons registered for the meeting and more than 400 persons stayed at the hotel for most of the meeting.



Vice-Presidents

Senior	Junior
Thos. R. Camp	*Fred. O. A. Almquist*
Cons. Engr.	*State Dept. Hlth.*
Boston, Mass.	*Hartford, Conn.*

Business Session

At the annual business session, officers and committee chairmen made their reports. Among the interesting items was the report that membership had now risen to 922 persons; and the *Journal* is reaching 1164 persons.

Once again the budget committee adopted a deficit budget. Last year's actual deficit was approximately $272 brought on mostly by increases in printing costs for the *Journal*.

The Committee on Committees recommended the discontinuance of the Committee to Investigate Grounding and the Committee on Meter Specifications (Joint with A.W.W.A.). The latter committee will wind up its work with the 1949 committee report. The

Here and There at The Balsams

"Bill" McGarry and friends on Neptune's Balcony.

Driving demonstration by "Bud" Bailey—The Balsam's "Pro."

Looking through Dixville Notch from The Balsam's front porch.

"Rollo" Blanchard, "Sid" Anthony, "Dick" Ellis et al on the lawn.

The Providence Richardson's, the Springfield Carlton's and Seaver Jones, N.Y.C.

Committee on Distribution System Safety was also recommended for abolishment, inasmuch as it was a joint committee with A.W.W.A. and discontinued by that association.

The suggestion was made that consideration be given to the establishment of a committee on stream pollution abatement as it affects water supply, inasmuch as stream classifications will be set by the new New England Interstate Water Pollution Control Commission.

The Committee on Committees again voiced its opinion that the N.E.W.W.A. should consider the establishment of a program of public education in the water supply field, through paid expert service or in some other way.

Honors and Awards

At the annual dinner, held on Thursday night, with the compliments of the Water and Sewage Works Manufacturers' Assn., the Association Awards were made.

Three longtime members were elected to **Honorary Membership** in the N.E.W.W.A. These three were: Roger W. Esty, Supt. Water and Sewers, Danvers, Mass.; Harry U. Fuller, Retired Chief Engineer, Portland Water District, Portland, Me.; and Timothy W. Good, Retired Gen. Supt., Water Dept., Cambridge, Mass. Both Mr. Esty and Mr. Fuller were present to receive their certificates from Pres. Arthur C. King.

The Award of the **Dexter Brackett Memorial Medal** was made to Edward L. Tracy, Director, Div. of San. Engr., State Board of Health, Burlington, Vt., for his paper, "Emergency Supply for Rutland, Vermont, Following the Flood of June 3, 1947."

Presentation of the award was by William B. Duffy, Chairman of the Committee on the Dexter Brackett Memorial Medal.

In addition to the above award, which has been made for a number of years by the N.E.W.W.A., the Executive Committee decided that there should be a second award for outstanding papers presented before the association and therefore this year created the Commemorative Award. Each year the award will be made in the memory of some outstanding member of the N.E.W.W.A.

Award Winners

Edw. L. Tracy
State San. Engr.
Burlington, Vt.
(Dexter Brackett Medal)

John J. Baffa
Cons. Engr.
New York, N.Y.
(Commemorative Award)

The presentation of the **Commemorative Award for 1948** was made to John J. Baffa, Cons. Engr., New York City, for his paper on "The Utilization of Electrical and Radio-Active Methods of Well Logging for Ground Water Supply Development." This award for 1948 is in memory of Fayette F. Forbes, Supt. Brookline Mass. Water Dept., 1878-1935. It was presented to Mr. Baffa by Arthur C. King, retiring president of the N.E.W.W.A.

Twenty-five year Service Certificates were made to Jacob A. Handy, Arthur C. King, and William J. Lumbert.

New Officers

New officers elected at the close of the three-day sessions were as follows:

President

S. S. Anthony, Supt.
Augusta Water District
Augusta, Me.

Vice-Presidents

Thos. R. Camp, Cons. Engr.
Camp & Dresser
Boston, Mass.

Frederick O. A. Almquist,
Prin. San. Engineer
Conn. State Dept. of Health
Hartford, Conn.

Directors

Stanley M. Dore, Dep. Ch. Engr.
Metropolitan Dist. Comm.
Boston, Mass.

William B. Duffy, Supt.
Public Works Dept.
North Andover, Mass.

Roger G. Oakman, Supt.
Water Division
Needham, Mass.

Treasurer

William P. Melley, Supt.
Water Dept.
Milton, Mass.

Secretary

Jos. C. Knox, Sr. San. Engr.
Mass. Dept. Pub. Health
Boston, Mass.

Some Who Participated in the Enjoyable Masquerade Party

British Practices

"CASUAL OBSERVATIONS ON ENGLISH WATER WORKS PRACTICES," by E. Sherman Chase, Cons. Engr., Boston, and Chairman, Committee on Reciprocal Relations with the Institution of Water Engineers, London, England.

Mr. Chase spoke of the use of pressure filters in England where they seem to be more prevalent for municipal service than in the United States, and he referred to the use of cement and bituminous lining as practiced in Sheffield, England, where soft, aggressive water causes tuberculation in cast iron pipe.

The effect of nationalization of industry has resulted in higher priorities for nationalized industries than is obtainable for the water works industry as far as securing supplies and maintenance materials is concerned.

In London, where Thames River water is used, it is first passed through large storage ponds. The result is the development of algae growths which would cause considerable trouble in rapid sand filters. For this reason slow sand filters are used, without coagulation. Experiments are being carried on, however, with a rapid filter pilot plant and with micro-screening.

The story was told of how the huge Queen Mary Reservoir was used during the war for experiments on one-man submarines. While most of the street damage from bombing has been repaired in London, there is still a great amount of leakage from the water mains, probably as the result of the bombings. Incidentally, it was reported that water consumption increased by 25 per cent during air raids.

Sanitary Engineers' Roster

"A NATIONAL ROSTER OF SANITARY AND PUBLIC HEALTH ENGINEERS," by Francis B. Elder, Engineering Associate, Amer. Public Health Assn., New York City.

Quoting from the report of the A.S.C.E. Committee on the Advancement of Sanitary Engineering, Mr. Elder pointed out that, as a profession, sanitary engineers have no single home, but are scattered through several organizations.

In order to have a roster of sanitary engineers available for emergency use and as a means of tying this group of engineers together, the A.P.H.A. is issuing a questionnaire to all persons connected with the field of sanitary and public health engineering. This roster development is complicated somewhat by the issuance of a questionnaire to all engineers by the A.S.M.E. under agreement with the Naval Research Board. There will be an exchange of information. Persons who are not contacted by one or the other of these questionnaires should advise the A.P.H.A. office.

Made Honorary Members

Roger W. Esty
Supt.
Water & Sewage
Danvers, Mass.

Harry U. Fuller
Former Ch. Engr.
Portland Water Dist.
Portland, Me.

("Wheel Horses" and Past-Presidents, both.)

Gate Valve Operation

"MAN-POWER VERSUS MACHINES FOR GATE OPERATION." Illustrations and field demonstrations by Payne Dean, Pres., Payne Dean and Co., Madison, Conn.

By means of slides and an informal presentation, Mr. Dean explained the operation of gate valves by gate valve operating machines. The problems of operating old valves were discussed, and Mr. Dean pointed out the need for regular operation to make sure that all valves in a system are in operable condition. He also suggested that there was a need for improvement in valve packing.

The second half of his presentation consisted of a demonstration of a gate valve operator of the portable type.

FORUM ON WATER WORKS OPERATING EXPENSES

An "OPEN FORUM ON WATER WORKS OPERATING EXPENSES UNDER POST-WAR CONDITIONS" was held with Edgar H. Hunter, New Hamp. Pub. Util. Comm., Concord, N.H., acting as Moderator.

First speaker on the Forum was **Arthur L. Shaw,** Partner, Metcalf and Eddy, Cons. Engrs., Boston. Mr. Shaw pointed out how with the cost of materials and equipment up, and productivity off about 14 per cent as far as manpower is concerned, the actual cost of construction and maintenance operation is now about 250 per cent of what it was in 1939.

A study of operating costs as related to income showed that for nine private plants operating costs had risen from 57 to 68 per cent of the annual income. For eight public plants, operating costs have risen from 32 to 49 per cent of the annual revenue.

More Who Participated in the Masquerade Party

Following World War I, costs of construction and operation dropped and levelled off, but since World War II, costs have continued to rise except for a slight dip within the past several months. There is no indication now that the peak has been reached, and Mr. Shaw said he had no reason to expect that water works operating costs would come down in the foreseeable future.

Second speaker on the Forum was **Percy A. Shaw,** Supt. Water Dept., Manchester, N.H. Mr. Shaw said he believed that inflation caused by the 50 cent dollar, which we now have, is the cause of the high cost of operation. At Manchester, for example, the payroll has increased 110 per cent since before the war, and labor is the biggest single item of operating costs. Power costs have gone down in the same period. He cited increases in many of the standard items of maintenance, service, and operation; a number of these items had more than doubled in price in ten years.

Mr. Shaw does not expect the situation to change, and he believes that it must be met by ingenuity of operation. Such practices as the use of mechanical equipment, and prethinking of maintenance jobs will help to cut costs. That is not enough, however, and income must be increased.

Mr. Shaw explained how Manchester increased income by levying charges for fire protection in private factories. While the income was forthcoming, it is not yet available until the courts have decided on the legality of the charge.

Next speaker on the Forum was **Theodore L. Bristol,** Pres. and Mgr., Ansonia Water Co., Ansonia, Conn. Mr. Bristol also cited the large increases in wages and salaries for labor, increases in real estate taxes, increases in income taxes, and increases in the costs of materials as factors in the increased operating costs for his water plant.

Last speaker on the panel was **Edwin T. McDowell,** Engr., Maine Pub. Util. Comm., Augusta, Me. Mr. McDowell pointed out that water plants are squeezed between fixed charges for water and rising operating costs. Applications before the commission for rate increases have grown to a flood in the past few years since the war. In Maine Mr. McDowell notes that water corporations have done better than water districts in the matter of obtaining increases.

The greatest increase in cost of operation is due to wage increases, because the trend is both toward a shorter work week and higher wages. This confirms the statements of the previous speakers.

At the present time deferred maintenance is of utmost importance in the matter of costs of operation. So much maintenance was left undone during the war that it has to be done now at times of higher prices. The amount of this spending should drop off within the next few years.

Mr. McDowell cited figures to show how increases in taxes were taking a larger and larger bite out of income. At the same time sizes of distribution systems have increased only about four per cent, while pumpage has gone up about 39 per cent. This means that the total investment per customer, and the total investment per unit of pumpage, has decreased. Both of these factors have tended to hold down the increase in percentage of revenue going to cost of operation. But such a condition can only lead to overloading equipment, and eventually new equipment and enlargement will be a necessity. Furthermore, all cities should aim at increased capacity for fire protection services, and this means increased expenditure for equipment.

New Directors

Roger W. Oakman
Supt.
Water Dept.
Needham, Mass.

Wm. B. Duffy
Supt.
Public Wks.
No. Andover, Mass.

Stanley M. Dore
Asst. Chief Engr.
Metro. Distr. Comm.
Boston, Mass.

Mechanical Pipe Joints

"THE USE OF DRESSER COUPLINGS IN STEEL TRANSMISSION MAINS," by Arthur S. Hicks, Dresser Mfg. Div., New York City.

According to Mr. Hicks, pipe joints should have tightness, flexibility, strength, ease and speed of installation and assembly, and should be economical. By means of slides showing various installations of Dresser Couplings, Mr. Hicks showed how this type of pipe joint met all of these requirements for a good pipe joint.

Formation of Snow and Rain

"THE FORMATION OF SNOW AND RAIN IN THE ATMOSPHERE," by Vincent J. Schaefer, Research Laboratory, General Electric Co., Schenectady, N.Y.

Dr. Schaefer explained how their studies began with investigations of the reasons for precipitation static in airplanes. Then followed aircraft icing studies, and this led to the study of super-cooled water, wherein it was found that ice forms only from the seeding of super-cooled water by ice crystals.

This led to studies of seeding clouds, although Dr. Schaefer emphasized that they were not trying to be

Winning Couple

"Ed" Hill, Pres. Hillco Supply Co., So. Sudbury, Mass.
Mrs. H. Seaver Jones, Far Hills, N.J.

A Winning Costume

Worn by
"Bud" Perkins, Centraline Corp., New York

rainmakers, and that there are many definite conditions that have to be met before a cloud can be turned into rain.

There are many other reasons for studying cloud seeding. These include the elimination of clouds over flying fields, the control of electrical storms, the control of hail storms, possibly the control of hurricanes, and the elimination of shade clouds when sun is desired. Rain making, as such, is a very secondary consideration.

By means of colored pictures, Dr. Schaefer showed where many of these studies have been made, including the weather station atop Mt. Washington, which has the "world's worst weather," having registered wind velocities of 231 mph. and temperatures of —46 deg. C.

In answer to a question from the audience, Dr. Schaefer said that it was possible to make boiling water freeze quicker than cold water in a refrigerator. One reason is because the hot water is a better conductor of heat, and another because of the nuclei in the boiled water. Actually, if conduction were equal, and precipitation nuclei were the same in two vessels of water (one hot and the other cold) in a refrigerator, and seeding of the water with ice crystals was the same, the cold water would freeze first.

Fe and Mn Removal

"Iron and Manganese Removal in the Spaulding Precipitator," by Russell H. Babcock, Whitman and Howard, Boston, Mass.

At Lowell, Mass., a pilot plant Spaulding Precipitator was installed to test its action on the removal of 4.4 ppm. of iron, and 0.8 ppm. of manganese. In order to obtain a sludge to start the operation, it was necessary to add 15 gpg. of alum and 8 gpg. of lime. It took 12 hours of operation to obtain effective results. Thereafter the alum dosage was reduced to 2.5 gpg. as was the lime dosage.

PH control is of utmost importance. The pH is an indicator of the stability of the sludge blanket. The optimum pH was found to be 8.5. All of the iron and manganese comes out in the floc and 95 per cent iron removal and 99 per cent manganese removal is obtained in the floc in the precipitator.

Convention Committee Chairmen

Entertainment
Reg. F. Hayes
Hydraulic Devel. Corp.
W. Medford, Mass.

Tech. Program
Truman H. Safford
Chas. T. Main, Engrs.
Boston, Mass.

Some of the floc goes to the filters, but this is a very small percentage. The load on the filters is decreased by use of the precipitator. The hardness of the water is increased from 48 to 90 ppm. in the treatment, and the pH drops from 8.5 to 7.0 as the water passes through the filter.

Diversion Damages from River Takings

"Diversion Damages Resulting from the Swift and Ware River Takings," by Walton H. Sears, Cons. Engr., Arlington, Mass.

Mr. Sears described the diversion of water from the Ware and Swift Rivers in Massachusetts to supply the city of Boston with sufficient water. As a result of the takings which were prescribed by legislative act and limited to certain amounts of water, and under certain conditions, there had resulted a number of suits for damages by industrial mills on these rivers below the taking points.

Mr. Sears reviewed a number of these suits and the results, and showed by tables and charts how much the suits had been for, what the engineers had estimated as a fair damage assessment and the amount of damage claims allowed and paid.

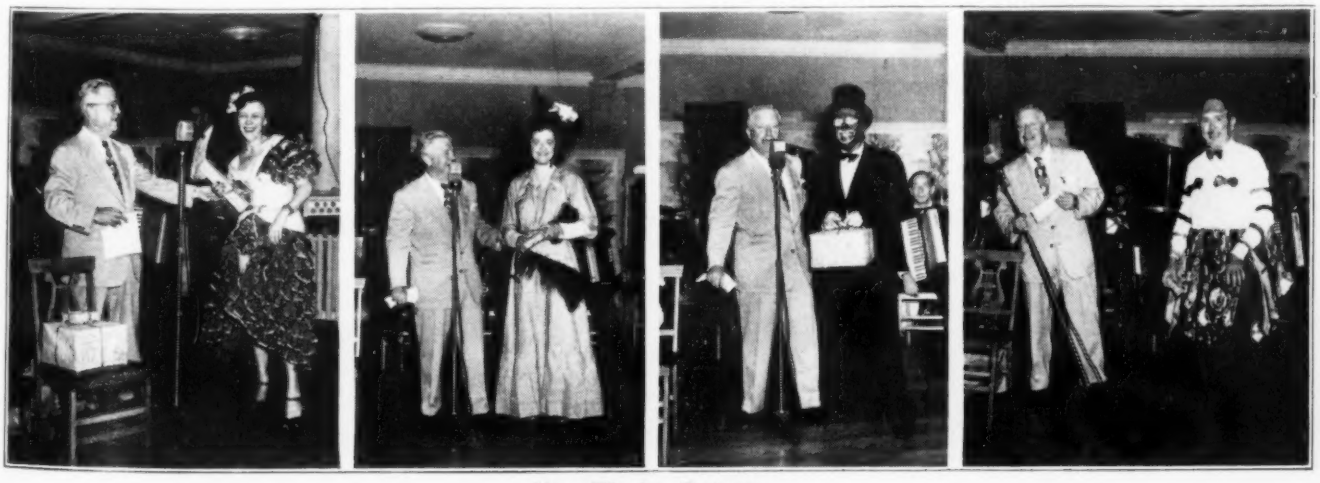
The suits cost $393,000; and the total damages paid under the suits amounted to $1,297,366. In addition, damages to the extent of $1,436,833 were paid by agreement without suit. Thus the total cost of these damages ran to $2,734,000 plus.

The paper was informally discussed by **Sherman Chase,** Cons. Engr. of Boston, who had been on the other side of many of the suits. Mr. Chase pointed out the difference between the situation in England (where provision is made beforehand for the amount of water to be let down) and this case, where needs of the industries were not ascertained before the takings were established.

Atomic Energy

"Mutual Interests Between the Water Works Industry and Atomic Energy Industries," by Arthur E. Gorman, San. Engr., Div. of Engineering, U.S. Atomic Energy Commission, Washington, D.C.

Mr. Gorman opened his remarks with the statement that as yet atomic



More Winning Costumes

Glamor
Mrs. John Finn
U.S. Pipe & Fdy. Co.
Boston, Mass.

Beauty
Mrs. "Don" Calderwood
Pennichuck Water Co.
Nashua, N.H.

Make-up
Mrs. "Stew" Newland
Wallace & Tiernan Co.
Boston, Mass.

Novelty
Clarence French
Ch. Engr. Water Div.
Waltham, Mass.

(Prize for Handsomest Men's Costume went to H. Seaver Jones, Pres., Centraline Corp., N.Y.C.—no picture—who wore a striking Highlander's costume.)

Programmers

E. T. McDowell
Engineer
Maine Util. Comm.
Augusta, Me.

Arthur L. Shaw
Partner
Metcalf & Eddy
Boston, Mass.

Theo. L. Bristol
President
Ansonia Water Co.
Ansonia, Conn.

Percy A. Shaw
Supt. & Engr.
Water Dept.
Manchester, N.H.

energy had not had much effect on the water works industry, because it has made its own supplies rather than calling for water from existing supplies.

One of the questions uppermost in the minds of water works men is concerned with the possible contamination of water supplies by radio-active wastes. These might come from wastes from atomic energy producing plants, from isotopes used in medicine, etc., or from war offensives.

Because of these possibilities, studies are under way to determine the limits of safe radio-active concentration for humans. Such radio active effects cannot be determined by the ordinary tests of a water plant: they cannot be seen, heard, felt, or tasted.

Mr. Gorman explained the different kinds of radio-active energy, including the alpha, beta, and gamma rays, neutrons, etc. He explained what protection is necessary for each kind of ray or particle and pointed out that while the human body rejects much radio-activity, some radio-active particles seek certain definite parts of the body where they lodge.

The unit of measurement was discussed and explained as the Currie, with a disintegration of 37 billion atoms per second. Safe tolerances are under study, and there are committees working on such phases as handling, monitoring, and waste disposal. Mr. Gorman expects that in the not too distant future limits will be set for water.

The time factor is important because of the importance of the half-life of radio-active compounds. At the Hanford works, cooling water is ponded for a definite time to allow the decay of half-life of the radio-active salts in the water, made so by the bombardment of the ions by neutrons.

At the present time the U.S.P.H.S. has specialists at work on the problem of radio-active wastes in water and sewage. It is found that radio-active material concentrates in sewer slimes. Where treatment is available, radio-active substances are generally removed, particularly by coagulation, but if the half-life of the material is long, then a problem exists in handling the sludge. Filtration offers a means of decontamination. Research is now being carried on to determine how effective is present treatment, and further studies are planned.

For the future we need water works operators with a knowledge of nuclear physics, and there is a need to train technicians in the field of atomic energy and water works operation. It will be a slow process of training the men needed to carry on the work. There are no training schools now, but Mr. Gorman says that younger men should begin the study of the problems involved. At least a year of basic training in nuclear physics is needed.

Mr. Gorman concluded with the statement that perhaps radio-activity could be used as a tool in water works operation, to study organisms, to study the flow of water, and such other matters as chlorination, ion exchange, and corrosion.

Concrete Mixes

"Modern Techniques in the Design of Concrete Mixes and the Method of Placing Concrete," by F. E. Votaw, District Engr., Portland Cement Assn., Boston, Mass.

Mr. Votaw opened his paper with the statement that one can not expect to obtain good concrete if any factors are neglected. Some of the factors which are of importance to good concrete are gravel, water, sand, cement, curing, and so forth. The cement paste is of utmost importance, and there must be a proper proportion of water to cement, as well as a proper proportioning of aggregate to cement paste. Among the five basic factors for good concrete are: Water-cement ratio, curing, size of aggregate, shape of aggregate, and sand content.

Mr. Votaw spoke about air-entraining cement, which contains a small amount of an organic colloid. This material improves the concrete and makes it more resistant to salts which may be spread on pavements to reduce ice formation in the winter.

Cement-Asbestos Pipe Effects on Water

"Observations on Water Samples from Cement-Asbestos Pipe Systems in Vermont," by Edward L. Tracy, Dir., Div., of San. Engr., State Board of Health, Burlington, Vt.

In commenting on the studies reported, Mr. Tracy emphasized that they were random observations, and did not constitute any long term research investigation. The data, however, do appear to have some significance as to the stabilization of cement-asbestos pipe over a period of time in soft waters. The data cited had no health significance, according to Mr. Tracy.

Samples had been collected from three different supplies, all of which were transported through cement-asbestos pipe. These included Brattleboro, Burlington, and So. Shaftsbury.

In brief, the data indicated that when the pipe was new there was an increase in pH, total hardness, and alkalinity of water passing through such pipe. The more sluggish the flow, the higher the increase observed, with highest results being noted at dead ends. After the pipe has been in service for a while it apparently becomes stabilized. In at least one instance a three-year period indicated the stabilization to be practically complete. The older the pipe, the less effect noted on the water supplies; and, in general, the effect entirely disappeared in time.

Earle A. Tarr
Supt.
Winthrop, Me.

Theo. L. Cate
Supt.
Laconia, N.H.

J. E. Hale
Supt.
Waterville, Me.

C. B. French
Ch. Engr.
Waltham, Mass.

Chas. Cromp
Supt.
Franklin, Mass.

It was also noted that new pipe recently installed showed far less effect in changing the characteristics of the water. As it was explained later, at least one company has reduced this leaching effect by adding silicate to the mix in order to tie up the free lime. This newer pipe shows far less tendency to leach.

In the discussion period which followed, **Don Calderwood,** Supt. Nashua, N.H., stated that after several years' operation a piece of cement-asbestos line looked unchanged on the outside, but showed a slight brown softening to a shallow depth on the inside.

A representative of "Transite" pipe stated that a 9½-year study of that pipe carrying water of 22 ppm. hardness showed a loss of only 0.012 in. inside due to leaching. A representative of Keasby & Matteson stated that a loss of only 0.005 in. would occur in the time necessary for stabilization.

After **T. R. Camp,** Cons. Engr., Boston, expressed the opinion that manufacturers of cement-asbestos pipe should eliminate leaching as a difficulty and make the pipe competitive with cast iron, **Mr. Maahs** of Johns-Manville Corp. told of the use of silica to minimize that problem.

SUPERINTENDENTS' ROUND TABLE

The "Superintendents' Round Table," always held on the closing forenoon, was sparsely attended. A paper scheduled for presentation by Martin E. Flentje of the American Water Works Co. on **"Telling the Public About Water Works Systems"** was presented by Edwin L. Jette, manager, Mystic Valley Water Co., Mystic, Conn. Amongst the several pointers given those called upon to speak on water supply, Mr. Flentje emphasized the value of the brochure issued by the Am. Water Works Assn., titled "Nuggets for Water Works Speakers," which contains so much useful information for preparing talks on the meaning of public water supply and the service rendered by water utilities.

E. E. Tankard
Supt.
Water Dept.
Berlin, N.H.

Payne Dean
Pres.
Payne Dean & Co.
Madison, Conn.

E. L. Jette
Mgr.
Water Co.
Mystic, Conn.

R. H. Babcock
Engineer
Whitman & Howard
Boston, Mass.

The second paper was presented by Ernest E. Tankard, Supt. of Water, Berlin, N.H., who reviewed **"The Operation and Maintenance of Pressure Filters at Berlin, N.H."**

In 1939 Berlin installed a pressure filter plant employing anthracite coal as the filter media. There are eight horizontal filters 18 ft. 6 in. long and 8 ft. diameter operating under 90 lbs. pressure on a gravity supply line. No chemicals are employed other than chlorine. However the filters remove as much as 10 cu. ft. of suspended matter per million gals. filtered. Designed for 2 mgd. the plant has turned out 3.5 mgd. when called upon to do so. Troubles developed when fine coal was discovered out in the system. In all 20 tons was thus lost and it was discovered that the beds had been inverted due to filter washing under such high pressure. The beds were removed, regraded and re-assembled. A wash water tank has now been provided.

Having noted an accumulation of muck on the filter surface, out from the tank walls 12 to 15 inches, experimentation proved that a jet surface wash line along the side walls of the filter would correct this situation and the filters were so equipped. This addition did correct the trouble. The filters being equipped for air-wash, the present method of washing which has proved "best by test," is to apply air-wash with the surface jets on for 15 minutes and this is followed by 15 minutes of water wash.

Mr. Tankard reported the correction of severe sweating of filters and piping through the use of pulverized cork held with sprayed shellac. The cork was applied by hand in four applications to secure a ⅜ inch covering. The cork was then painted grey with a spray gun. The results have been very satisfactory.

Mr. Tankard's paper brought forth a number of questions and discussion in which it was indicated that the air-wash at Berlin had proved a valuable adjunct for the purpose of disintegrating and forcing to the bed surface the organic matters deposited therein, there being no coagulant employed and the anthracite beds serving as strainers. **T. R. Camp** was of the opinion that high velocity water-wash would accomplish the same result except that loss of the low gravity anthrafilt would result. **L. H. Enslow** had a different opinion and pointed out experiences with air-wash which could not be equalled with water wash alone regardless of rates of wash rise tried. It was his belief that some form of scrubbing effect was highly desirable, such as the jet surface wash or air-wash properly designed and used.

The President's Address

Regrettable, to our thinking, is the custom of NEWWA in announcing the new officers and having the President's address as the last two things on the program. The result is that the retiring president delivers his address to empty chairs for the most part and members and guests do not hear who the new officers are until after the meeting.

Amongst the things that President King had to say was to praise the work of Secretary Knox. He noted the improved interest in the Association and better attendance at meetings. In the matter of water works management and operation Mr. King decried curtailment of water use by consumers due to water shortages or system deficiencies. He urged water works men to plan for abnormal conditions, give service regardless and provide as much water as the public

H. W. Lea
Cons. Engr.
Montreal, Que.

H. W. Griswold
Consultant
Hartford, Conn.

Allan Symonds
Vice-Pres.
W. W. Service Co.
Islington, Mass.

C. G. Hammel
Water Comm.
Manhasset, N.Y.

Karl Kennison
Chief Engr.
Metro. Dist. Comm.
Boston, Mass.

Demonstrations of Payne Dean's New Valve Operating Units

may wish to buy. This matter of curtailment of water service or water use was strongly decried as a serious weakness and reflection on the water utility. He called for more publicity by water works managers and less self-effacement through planned public relations programs. He saw the need for legislation, unfortunately, to prevent capture of water works funds—at least in Massachusetts. He thought that the New England Water Wks. Assn. should amplify its efforts to secure new members and also find something for these members to do.

After the Teller's report on the results of the election of new officers and the turning over of the gavel to incoming president, Sidney S. Anthony, the 68th Annual Convention came to an end.

W. Chester Morse Passes

William Chester Morse, Supt. of the Seattle, Wash., Water Department, passed away late in September at the age of seventy-five.

Mr. Morse, a native of Evanston, Ill., went out to Seattle in 1883 as a young homesteader. He grew with the city, and loved it. In 1927 he became City Engineer of Seattle, having established himself previously as an authority and consultant on earth movements and water supply in the Northwest. In 1931 he was appointed superintendent of the City Light Dept. and in 1938 was made superintendent of the Water Department, the position he held until his death. His record in the public service, and his judicial mind, caused his election to the chairmanship of Seattle's Board of Public Works, and he also served on other governmental committees of the City.

Mr. Morse served in World War I, and rose to the rank of major. He had long been a member of the Am. Soc. of Civil Engineers, and the Am. Water Works Assn., and had served the last named as a highly valued member of its Board of Directors for a three year term, during which he contributed much in clarifying issues and expressing his always practical views, backed by experience, analytical ability and exceptionally keen vision.

Mr. Morse, a valued contributor of articles to *Water & Sewage Works*, recently published a humorous commentary on the troubles of the waterworks man in our September issue, which we captioned "All Is Serene In Seattle." Shortly before his death he contributed another article which is to be published this month or next.

F.S.W.A. Sewer Ordinance Manual Available

The Fed. Sew. Wks. Assns. Manual of Practice No. 3, "Municipal Sewer Ordinances," has recently been published and is now available. This manual has been developed by a committee working for three years under the chairmanship of Prof. Don E. Bloodgood, Purdue Univ. The 44-page bulletin was prepared to fill a long-standing need for authoritative guidance in the regulation of usage of public sewer systems.

The bulletin covers such important considerations as the consequences of inadequate control of sewer usage, and in addition presents and describes various types of regulations, with a detailed discussion of present practices as determined from a large number of prevailing ordinances.

Of particular significance is the coverage of policies and recommended practices for the admission of industrial wastes into sewers and the treatment and disposal of those wastes by the municipality. This section of the manual also contains a procedure for evaluating and handling industrial wastes, and a discussion of the limiting values for objectionable characteristics.

A "model" ordinance is included to illustrate application of good practice, and suggested permit forms are shown. The manual will be both of interest and use to municipal officials and attorneys, consulting engineers, and those charged with the operation of municipal sewage works.

Copies of Manual of Sewage Works Practice No. 3, "Municipal Sewer Ordinances" may be secured for $1.00 per copy from the Fed. of Sewage Works Assns., 325 Illinois Bldg., Champaign, Ill.

H. G. Tischer Honored

H. G. Tischer, Manager of Water, Gas and Sewage Disposal, Duluth, Minn., and Chairman of the Minnesota Section of A.W.W.A., was hon-

ored at the recent meeting of that section. The award, presented by the *Minneapolis Star and Tribune* for leadership in the state, is titled, "In Recognition of Leadership in Minnesota," and contains the proclamation—"Whereas, H. G. Tischer as Chairman of the Minnesota Section A.W.W.A., has given a service to Minnesota that has added to this state's supremacy as a place in which to live and work, has brought additional respect to his professional organization and has enhanced his own prestige as a citizen, the *Minneapolis Star and Tribune* presents to him this Leadership Award."

EXPERIENCES WITH BREAK-POINT CHLORINATION

Some Being Confirmatory; Others Being Non-Confirmatory

by

CHAS. M. GARD

Alden E. Stilson & Associates

COLUMBUS, OHIO

The Author

THE satisfactory control of taste and odor problems in potable water supplies has continuously demanded the attention of all persons who have been responsible for producing water for domestic consumption. The work of individual investigators as far back as 1919 indicated that the higher the rate of chlorine dosage to water, the greater would be the absence of tastes and odors in the water. Approximately ten years ago the results of many investigations culminated in a treatment process for taste and odor control known as "Breakpoint Chlorination."[1]

It is the purpose of this article to describe the author's experiences in the initiation of and subsequent use of break-point chlorination for taste removal from the water supply at the Branch, United States Disciplinary Barracks, Greenhaven, New York, during a period of about 2½ years.

Description of Water Supply and Treatment Facilities

The water supply for the Branch, United States Disciplinary Barracks, was an impounding reservoir fed both by a surface stream and by springs. This reservoir had a capacity of about 60 mg., a surface area of approximately 70 acres, and a maximum depth of about 25 ft. During the summer months, algae growths and organic content were high. Although frequent treatments of the reservoir with copper sulphate kept the appearance of the reservoir satisfactory, objectionable tastes resulted from the reaction of chlorine with these organic materials.

The reservoir supplied the treatment plant by gravity through a cast-iron pipe line. The time of travel of the water from the reservoir to the plant was approximately six hours at the design rate of flow of 0.75 mgd.

The treatment plant provided for the addition of chemicals, coagulation, sedimentation, rapid sand filtration, pre-chlorination, post-chlorination and ammoniation. A taste problem was anticipated by the designers, so that facilities were also provided to feed activated carbon. It was added to the water at the same point as the coagulant.

The original operation of the plant was based on the use of a chlorine-ammonia treatment supplemented with activated carbon for taste and odor control. The raw water at times had a mild "fishy" odor, but this was removed by the treatment so that it was not a problem. However, the taste problem was very severe during the summer and fall months. Ratios of chlorine to ammonia varying from 2 to 5 were tried and activated carbon was added in amounts up to 30 ppm. Although some improvement in taste was accomplished, it was far from satisfactory. Consequently, it was decided to try "break-point" chlorination for taste control.

Experimental Work

Before trying break-point chlorination on a plant scale, it was decided to experiment first with jar tests in the laboratory. The results of these tests indicated that the existing chlorinator capacity would probably be inadequate. However, since the existing capacity was so close to indicated requirements, it was decided to try it on a plant scale anyway. The break-point could not quite be reached, with the result that the water tasted even worse than before. A larger capacity chlorinator had to be procured.

The jar tests proved to be remarkably accurate in predicting what to expect in plant scale operation. The results of these jar tests showed these facts:

1. Prior to the development of heavy algae and other growths in the impounding reservoir, the break-point would probably be reached with a dose as low as 2.5 ppm. of chlorine. Actual plant operation the following winter required between 2 to 3 ppm. applied chlorine. Fig. 1B shows a typical curve as developed from laboratory tests. At the point of dip, corresponding to 2 ppm. applied chlorine, the total residual was found to be 100% free chlorine. Beyond this point, with larger chlorine dosages applied, there were no chlorinous or other objectionable tastes.

2. The "break-point" was not always well defined, as is quite frequently the case with some waters. It will be noted that the curves shown in Fig. 1C and 1D did not even have the mild dip as in Fig. 1B. These curves for a 4-hour contact time show a mild rise in residual, a leveling off, and then a sudden rise at about a 45° slope. These curves were a combination of the general curve types "B" and "C," as defined on Pages 14-17 of technical publication No. 207 by Wallace & Tiernan Co., Inc.[1], and which are reproduced in Fig. 1A. Type "C" is characterized by a "soft, low-colored water containing small amounts of organic material such as algae or color. As the algae content increases, the curve for type C tends to approach that for type B." This aptly identified the water supply at the Branch, United States Disciplinary Barracks.

3. The change from a poor taste to a good taste was abrupt and fell within a difference of as little as 0.5 ppm. applied chlorine. In other words, a dose of 2.5 ppm. of chlorine could produce a poor tasting water, while a dose of 3.0 ppm. would give a palatable water. This indicated the need for careful control in plant operation, so as to assure always being beyond the "break-point." Otherwise, a relatively small drop in chlorine residual in the distribution system might easily result in a partial reversion to chloramines with the accompanying poor tastes.

Operation

Break-point chlorination was permanently adopted during December, 1944. Insofar as taste and odor con-

trol were concerned, the results were excellent.

Initially, all of the chlorine was added to the raw water entering the plant ahead of the addition of any chemicals. Plant control of the chlorine application was effected by maintaining a predetermined minimum chlorine residual in the water as it left the coagulation tank. This represented a contact time of about 30 min. This short time made adjustments of chlorine feed rates easy; and, after a few days of trial, no trouble was encountered in maintaining uniform chlorine residuals in the treated water leaving the plant. The total contact time through the plant ranged from 6 to 8 hours, which included the detention period in the clear well preceding the high lift service pumps. After a few days' operation, only 0.1 to 0.2 ppm. chlorine was lost in passing through the rapid sand filters. This loss then remained constant regardless of the condition of the raw water.

Initially, the chlorine applied was sufficient to produce a 1.0 ppm. total residual in the water leaving the plant, of which at least 90% was free chlorine. This high residual was considered to be necessary to overcome a reversion to chloramines in the distribution system and to satisfy the chlorine demand of organic accumulations then assumed to be present in the pipe lines. Actually, this would not have been necessary, because the free chlorine residual held up and a total residual of 0.7 ppm. was obtained at the farthest point in the distribution system, which was a dead-end line ¾ mile distant from the plant. Unlike results reported by other operators, no undesirable chlorinous tastes were encountered during this initial operation. This evidently was due to the fact that the filters were reasonably clean, the distribution system was only four years old at the time, and there were very little, if any, accumulations of organic material yet formed.

Eventually, the residual leaving the plant was reduced to 0.6 ppm. total residual (100% free chlorine) providing 0.3 to 0.5 ppm. total residual in the system with no less than 90% free chlorine at any time. This appeared to be a matter of import, since experience indicated that a minimum of 90% free chlorine residual was necessary in the water leaving the plant to maintain satisfactory conditions in the distribution system. Also, it was found that a free chlorine residual of less than 0.6 ppm. resulted in partial reversion to chloramines because it was so close to the "break-point," as is illustrated by the 4-hour contact curve in Fig. 1D. Chlorine fed to the raw water ranged from 2 ppm. during the winter months to as much as 11 ppm. in the summer months.

It is interesting to note that the only justified complaint made of the quality of the water with a 1.0 ppm. total chlorine residual was from the mess-hall personnel. For some unexplained reason, this higher residual affected the taste of the coffee, but it was determined that when the residual was reduced to approximately 0.6 to 0.7 ppm. leaving the treatment plant it caused no trouble in this respect.

The OTA (ortho-tolodine-arsenite) test[3] was used originally in determining all chlorine residuals, but it was later found that for our conditions the ortho-tolodine flash test (15 seconds) followed by a 5-minute reading, using only ortho-tolodine, was sufficiently accurate and far simpler. The 15-second reading indicates free chlorine, the 5-minute reading indicates total free and combined chlorine, and the difference of the two readings is the combined chlorine. The OTA test, however, was used periodically as a check against the possible presence of interfering substances which might give a false chlorine residual.

Bacteriological Results

Before starting break-point chlorination, the total plate counts at 37°C., made on samples of the treated water taken at random points each month throughout the distribution system, ran consistently over 300. After starting break-point chlorination, the plate counts on samples from the distribution system for the subsequent 18 months' period were as follows:

Plate Count	No. of Samples
0	25
10 (or less)	57
10 (or more)	26

No significant change was observed in the record of gas-formers, the water being satisfactory under both conditions.

pH Determinations

The higher quantities of chlorine present affected pH determinations with Bromthymol Blue indicator solution. The result was an immediate fading toward the yellow side of the indicator, so that an actual pH of 7.5 might be read as 6.8. Dechlorinating the sample with sodium thiosulfate before adding the Bromthymol Blue was tried and was found to be effective. After experimentation to determine the correct amount of thiosulfate to be added so as not to affect the pH, and yet be sufficient to insure dechlorination of the water sample, this step was added to the standard procedure for pH determinations.

Chlorine Odors in Plant

Although break-point chlorination proved to be successful from the standpoint of taste removal, its use was accompanied by unexpected plant operation troubles.

When higher quantities of chlorine required for break-point chlorination were added during the summer months, considerable trouble was encountered from strong chlorine odors which were being released from the open flash-mix tank inside the control building. The chlorine was being injected into the raw water line under pressure about 20 ft. from the point of free-fall discharge into this tank. This condition created an aerating effect. The gas being released had a strong chlorine odor and was very irritating to the eyes. The building windows had to be kept open to provide good ventilation, and the tank was covered. This proved to be only a temporary expedient to minimize the trouble, but did not eliminate it.

Based on the evidence at hand and on the experiences as reported by others, it was concluded that the gas was not true chlorine, but probably was nitrogen tri-chloride, in part at least. This fact was never established because sufficient laboratory facilities were not available for analytical work.

Because this trouble was only encountered when the organic content of the raw water was high during the summer and early fall months, it was believed that the trouble might be due to insufficient contact time between the chlorine and the high organic content of the raw water, resulting in only partial reactions before being discharged into the open flash-mix tank.

In August, 1947, a gas chlorinator was installed at the raw water impounding reservoir to chlorinate the raw water as it entered the pipe line leading to the treatment plant. This provided a 6-hour contact time before the water reached the plant.

For the first two days of this operation, a total of 80 lbs. of chlorine was fed to clean the line of organic growths. By the third day a chlorine residual was obtained in the water as it reached the plant and the rate of feed was reduced to 20 lbs. per 24

hours. During the following month of September, the chlorine rate of feed at the reservoir reached a maximum of 30 lbs. per 24 hours. The amount of chlorine fed at the reservoir was always maintained less than the total requirements, so that control of the chlorine residual in the treated water could be effected by supplementary pre-chlorination at the plant.

This change in chlorination procedure resulted in complete elimination of the chlorine odors in the control building. The rate of chlorine feed at the reservoir did not have to be as accurately controlled, so that the operation of that chlorinator was not tedious, even though it was remote from the water treatment plant.

Iron and Manganese

In July, 1945, it was noticed that for the first time the filter sand was becoming coated with a dark brown material to a depth of 15 inches. Wash water remained a brown color after 30 min. of washing, and filter runs dropped to as low as 10 hours. In the late Fall, filter runs began to increase.

Analyses of the coated filter sand showed this material to contain both iron and manganese. Iron and manganese determinations were made on the raw water each month after this time. It developed that during the months of July, August, and September the iron content of the raw water would reach 0.4 ppm., falling off to 0.1 to 0.2 ppm. during the other months of the year. No manganese was reported by the laboratory in any of the raw water samples analyzed. The mystery of how the manganese was in the filters but not found in the raw water was never satisfactorily solved.

Although the presence of iron (and presumably manganese) in the raw water had not been of any consideration up to this time, we found ourselves inadvertently involved in iron and manganese removal by virtue of the presence of free chlorine residuals throughout all the water treatment units. The work reported at Montebello Filters, Baltimore, Md., by Edwards and McCall[3] in this magazine (1946) is particularly interesting with respect to the effectiveness of break-point chlorination for manganese removal.

Coagulant

Originally alum was used as a coagulant with soda ash for pH control. The floc formation with these chemicals was poor, and laboratory tests revealed no clue for improvement. Consequently, it was thought that break-point chlorination might improve this condition. However, in

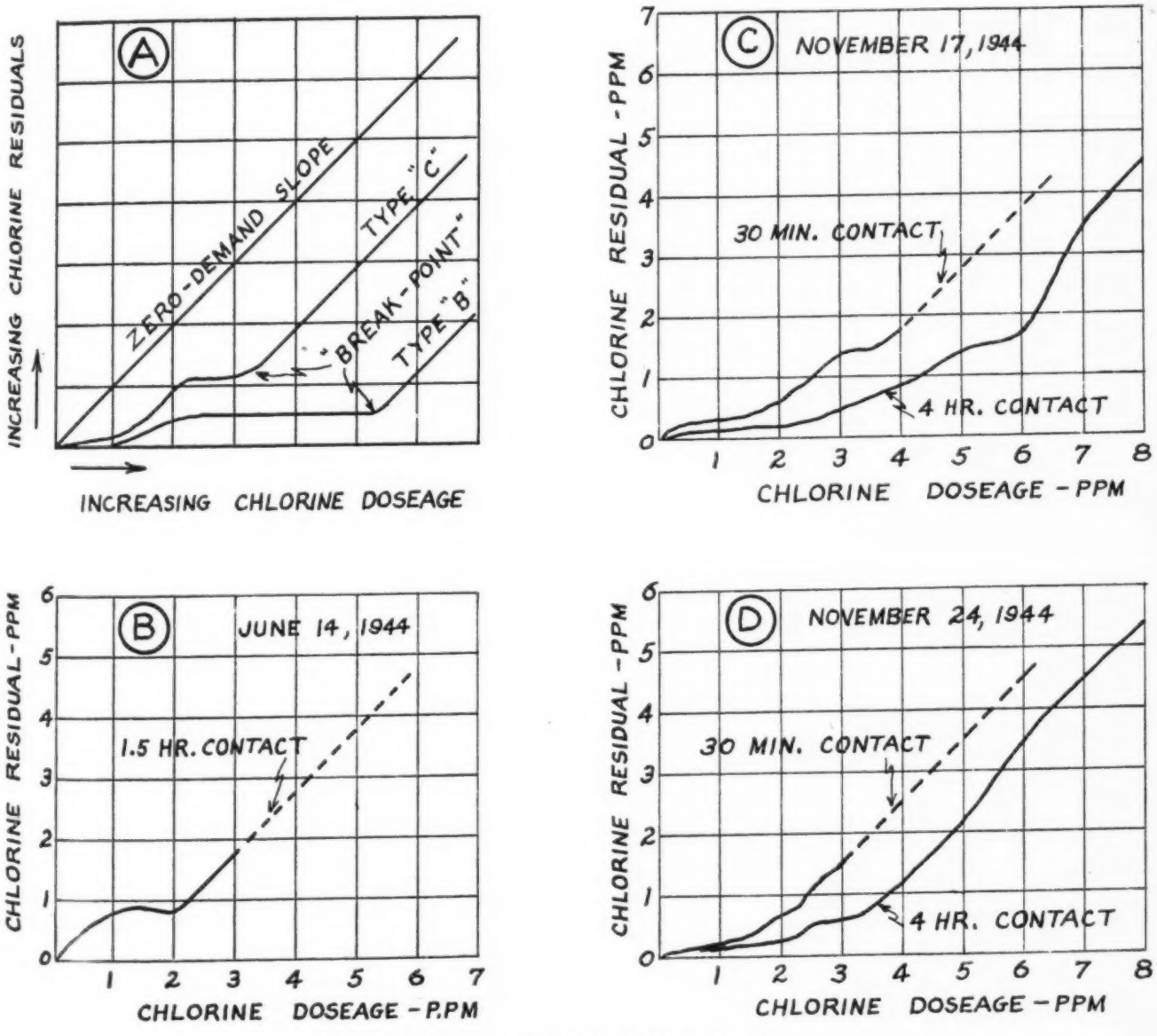


Fig. 1—Experimental "Break-Point" Chlorination Curves

this instance break-point chlorination neither improved the alum floc, nor reduced the amount of alum required. In other instances such advantages from raw water chlorination have come to the author's attention.

The solution to this problem proved to be independent of the chlorination procedure. It was found that a satisfactory alum floc could be produced only with the use of lime in sufficient amounts to raise the pH to 8.3 or higher. In lieu of alum, ferric sulphate ("Ferri-Floc") was employed as the coagulant. It proved to be satisfactory over a wide pH range.

Acknowledgments

The author wishes to acknowledge the assistance of his past associates in the Engineer's Office, Headquarters First Army, in assembling and evaluating the data in connection with the work described herein.

References

1. Technical Bulletin No. 207, Wallace & Tiernan Co., Inc., "Taste and Odor Control with Break-point Chlorination."
2. Halliman, F. J. "Tests for Active Residual Chlorine and Chloramine in Water." *Journal American Water Works Association*, 36:296, 1944.
3. Edwards, S. E., and McCall, G. B. "Manganese Removal by Break-point Chlorination." *Water and Sewage Works*, 93:303, 1946.

NO. CAROLINA HOLDS SHORT SCHOOL

Pictured in the accompanying photograph are more than 70 water works operators, technicians from industrial plants, and State Board of Health officials who attended the five-day school of the No. Car. Water Works Operators' Assn. held at Duke University College of Engineering, Durham, N.C., during the first week of August.

The meeting was designed to acquaint water works personnel with the latest developments in water purification processes and to provide for a voluntary system of certification for water works operators. The school consisted of intensive laboratory and classroom work.

The "faculty" was headed by Dr. W. Brewster Snow, Assoc. Prof. of Civil Engr., and included instructors from Duke University College of Engineering, the School of Medicine, and the Depts. of Chemistry, Biology, and English. Non-resident instructors were Univ. of No. Car. School of Public Health personnel, six water works operators, and nine representatives of industrial concerns.

"C", "B" and "A" certificates were awarded to registrants qualifying for same. In addition there was an advanced "program" for persons who were awarded "A" certificates in previous years.

PROF. VELZ GOES TO UNIV. OF MICHIGAN

The University of Michigan School of Public Health has announced the appointment of Clarence J. Velz as Professor and Chairman of the Dept. of Public Health Statistics.

Prof. Velz is a graduate of the University of Minnesota and Columbia University and holds the degrees of Civil Engineer, and Master of Science in Public Health. For the past eleven years he has served as Professor of Sanitary Engineering and Head of the Department of Civil Engineering at Manhattan College, New York City.

Among the contributions which Prof. Velz has made to sanitary engineering are papers on public health statistics, stream pollution, with particular reference to oxygen balance, and most probable numbers of coliform bacteria. At least two of his papers have won awards for outstanding research, and he has served on several important commissions, notably those concerned with the pollution of the Hudson River and New York Harbor.

Prof. Velz is also a co-author with Earle B. Phelps of a book on public health engineering. For the past two years he has been program chairman of the N. Y. State Sewage Works Assn. He is also a member of A.S.C.E., A.P.H.A., and A.W.W.A.

Pomeroy and Westcott New Consulting Firm

Announcement has been made of the partnership association as Consulting Chemists and Engineers of Richard D. Pomeroy, Ph.D., and Ralph M. Wescott. The new consulting engineering firm will be located at 660 South Fair Oaks Ave., Pasadena 2, Calif.

Mr. Westcott was formerly head of the Ralph M. Westcott Co. in Los Angeles. Mr. Pomeroy has been a consultant in Pasadena since 1940 and prior to that was associated as research chemist with the Los Angeles County Sanitary District.

A RESERVOIR DIFFUSION SYSTEM

Installed to Preclude Semi-Stagnation of Storage Water

by

WM. C. MORSE
Supt. of Water
SEATTLE, WASH.

ABOUT two years ago this department was troubled with semi-stagnant water in the large twin reservoirs on Beacon Hill. These twin reservoirs hold sixty million gallons and fifty million gallons respectively, making a total of one hundred ten million gallons. The two reservoirs are separated by a barrier through which water can be, and normally is, passed with gates open. These gates can be closed and either reservoir operated alone, while the other can be either kept full or empty as might be desired.

While the semi-stagnant water in the far reservoir did not develop any material difficulty, it was felt that under certain conditions of operation, trouble might result. Therefore, it was determined to spread the incoming water in such a manner that it would be impossible for stagnation to occur.

The method used was the installation of a 24 in. steel main running along the two sides of each reservoir opposite the corners from which the water has heretofore entered and left these reservoirs. This steel main was reduced at intervals along its course from 24 in. to 20 in. to 16 in. and finally to a 12 in. size at the far end. At regular intervals 2 in. nipples were set into the diffusion line, with the nipples pointed vertically.

The Late Author

(Elsewhere in this issue is an account of the passing of the author and some of his life history.—Ed.)

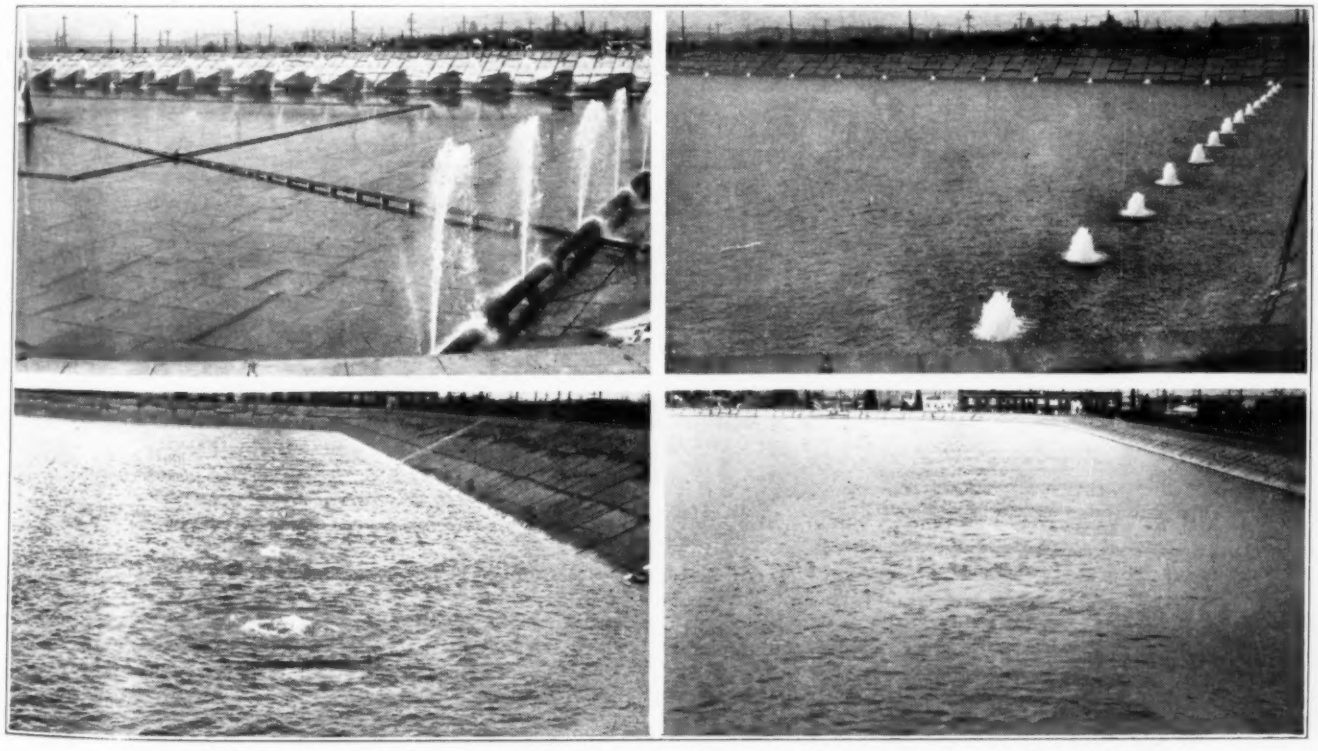
Each of the twin reservoirs has a fountain near the center, through which a small proportion of the incoming water is vented for purposes of aeration and display.

With the reservoir empty and the water first turned on the first of the four accompanying views shows far better than words can describe just the results attained. Then, as the water rises in the reservoir and the supply main is covered, there is shown in the second picture the effectiveness of the supply jets and the beautiful balance that has been attained from the jets.

Another progress picture shows the jets nearly drowned out but still plainly visible. And the final picture shows nothing but the boil on the surface of the reservoir, which still lacks about 3 feet of being filled to its full depth. This view shows that the water is in turmoil clear up to the sidess of the reservoirs, which means that there can be no stagnant water as it is all in motion.

The net result of this installation in the twin reservoirs has been that no stagnation of any kind is present and all influent water must cross the entire width or length of the reservoir before finding an outlet.

The design is that of the City Engineer of Seattle, and the method was completely successful.



View of One of the Empty Reservoirs with Inlet Jets in Action and Progressive Pictures During Filling

LITTLE ROCK INCREASES FILTER PLANT CAPACITY

by

L. A. JACKSON
Manager-Engineer
MUNICIPAL WATER WORKS
LITTLE ROCK, ARK.

TWO years ago preliminary studies were made and engineering data submitted to the Board of Water Works Commissioners which indicated that steps might have to be taken to increase the capacity of the filter plant. Upon review of the engineering data, the Board approved the construction of additional filters and authorized plans and specifications to be prepared, with the intention of having the filter plant in operation in time to handle the summer demands of 1949. It may be of interest to review some of the consumption statistics that led to the prompt action of the Board.

The Author

Water Consumption Statistics

When the city of Little Rock purchased the water system in 1936, the average daily water consumption was 6.7 mil. gal. During the latter part of the "30's," the water consumption remained nearly constant, advancing only to 6.9 mil. gal. by the end of 1940.

In 1941, with the advent of the war and the activation of Camp Robinson, water usage made a sharp increase, from 6.9 to 9.5 mgd.

Since 1941, with the exception of one year, there has been a steady increase in water consumption with the result that at the end of 1948 the average had risen to 12.7 mgd. From these figures it can be seen that in the 12 years of city ownership the amount of water used daily has almost doubled.

This increase can be largely attributed to the fact that the excellent quality of the water has attracted many industrial concerns to locate in Little Rock. The normal population increase in Little Rock has also been a contributing and major factor.

Immediately following the purchase of the water system by the city, a new source of supply and a new filtration works were constructed. The new supply, Lake Winona, has a safe daily water yield of approximate-

Interior View of Little Rock Filter Plant

ly 34 mil. gal., which is far in excess of the present daily water demand.

1936 Filter Plant

The new filtration plant, constructed in 1936, had a designed capacity of 8 mgd. This plant together with the existing old filter plant had a normal daily capacity of 15 mgd. It was considered at the time that the total filtration plant capacity would be sufficient for many years. This was substantiated by the fact that during the period from 1936 to 1945 the capacity was more than sufficient, since the days of maximum water consumption in the summer months rarely ever exceeded 15 mil. gal.

Since 1945, however, the normal filter plant capacity of 15 mgd. has been exceeded more and more often during the summer months. During the summers of 1947 and 1948, in order to furnish the city with water, it was quite common practice to operate the filter plant at rates exceeding 20 mgd.

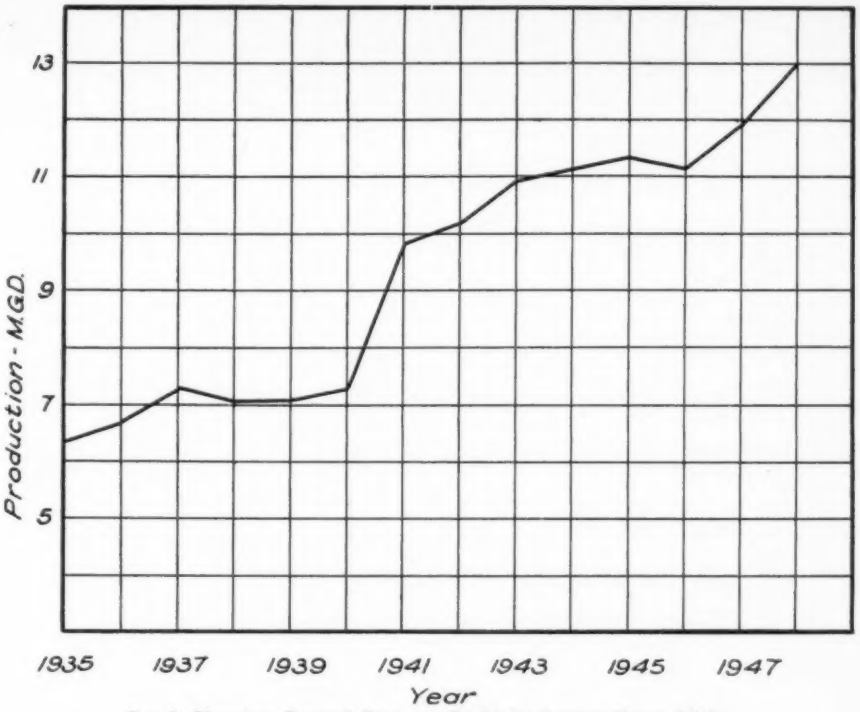
Increased Capacity Required

It is not a good policy to overload a filter plant continuously; therefore this fact prompted the Board's decision to begin construction and increase the normal filter plant capacity from 15 to 23 mgd. The project, therefore, consisted of an addition of four 2 mil. gal. filter units to the plant that was constructed in 1936, doubling the size of the plant from 8 to 16 mil. gal. This coupled with the old 7 mil. gal. filter plant brings the total capacity to 23 mgd. At the present time the filter plant has a normal rated capacity nearly twice as great as the average daily consumption, and in the event of an emergency the filter plant can now deliver almost three times the present average water demand.

Preliminary studies were made in 1947, and in March, 1938, plans and specifications covering the new filter plant addition, prepared by Burns & McDonnell Engineering Co. of Kansas City, Mo., were submitted and approved by the Board. In March, 1948, bids were reviewed covering the installation of filter plant equipment, and this work was awarded to E. W. Bacharach Co. on their bid of $94,968.00.

In May, 1948, bids were reviewed covering the construction of four filter units and the building, and the contract was awarded to the Tri-States Construction Co., Little Rock, on their bid of $120,000.00.

On June 17, 1948, excavation of the new plant was started and by the end of the year the construction was approximately 50 per cent complete.



Graph Showing Annual Average Daily Production Since 1935

New Plant In Service

A portion of the new plant was placed in service July 15th, and the entire plant went into operation by August 15th.

All construction work and operating equipment used in the new filter plant is of the latest approved design, allowing the filter plant engineer to increase the water output instantly in order to take care of increased demands for water service.

This improvement brings the capacity of the filter plant up to the rated capacity of the transmission line from Lake Winona and the capacity of the distribution system to deliver water to 26,000 customers. This means that the plant capacity of the entire system is in balance, a factor that should improve the over-all grading of the system by the National Board of Fire Underwriters.

The new filter plant addition, together with more than 1.5 million dollars in expenditures for distribution facilities, eliminates some of the major deficiencies and should qualify the water supply system for a second class rating on the next inspection by the Underwriter Engineers. If other grading facilities show improvement by the time of the next inspection, this should mean a substantial reduction in fire insurance rates in this community.

The entire construction program has been entirely financed from earnings without any increase in indebtedness, and the completion of this project brings the total valuation of the physical property to a figure exceeding $9,000,000.00.

The accompanying graph shows the average annual daily production of water since 1935. The increase in demand and consequent need for increased facilities is evident.

New York's Owl's Head Plant to Have Six Dual Fuel Engines–7800 H. P.

The New York Sewage Treatment Plant, now under construction at Owl's Head Point in Brooklyn, will have a capacity of 160,000,000 gals. per day, providing activated sludge treatment.

This newest of the New York plants will be equipped with six "Superior" dual-fuel type Diesel engines, each producing 1300 H.P. These engines being supplied by the National Supply Co. of Pittsburgh, Pa., will drive six 900 kw 60 cycle, 4160 volt A.C. generators with direct connected exciters.

New York is believed to be the first city to test and prove the adaptability and economy of the "dual-fuel" Diesel in power production at a sewage treatment plant, wherein any deficiency in gas production is made up by the requisite quantity of fuel oil, automatically, until gas from sludge digestion again proves ample to maintain full engine operation on gas alone.

PUERTO RICO PROVIDING COMPREHENSIVE WATER SUPPLY AND SEWERAGE SYSTEMS

Spending $25,000,000 on Water Supply; $15,000,000 for Sewerage Facilities

by
LEONARD BOURNE
SAN JUAN, P.R.

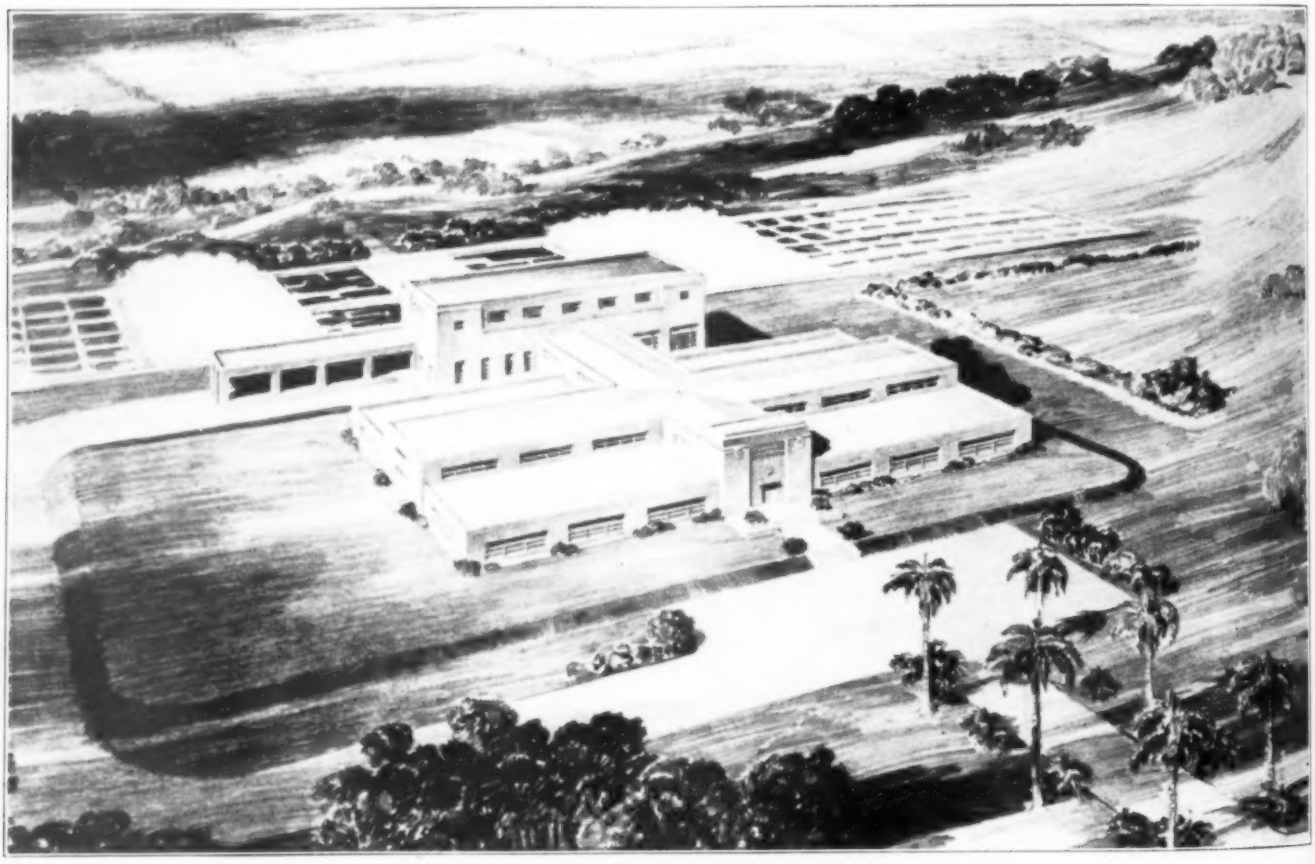
THE first phase of Puerto Rico's forty-million dollar island-wide water supply and sewerage program that has integrated the municipal services of more than seventy communities on the Island is rapidly nearing completion with construction of the Rio Grande de Loiza water supply reservoir filtration plant and pipeline. When completed the Loiza (San Juan) project will be the largest water supply system in the Caribbean.

In Puerto Rico, as in all tropical countries, the water supply problem has been a critical one, with the health and economic progress of the people dependent upon the solution of the water problem. There is no shortage of water in Puerto Rico, although there has been until recently a lack of sufficient safe and palatable water and facilities for delivering it under adequate pressures to all parts of the Island.

The Loiza project, now under construction, is designed to provide adequate and healthful water service to the 400,000 residents of the greater San Juan area—a region comprising about 12 communities surrounding the Puerto Rican capital. It will consist of a dam and an 8,000,000,000 gallon reservoir, hydro-electric plant, pumping station, and pipeline to a modern filtration plant. The latter is expected to be in partial operation this year. Until the dam is completed, the new filtration plant of 30 mgd. capacity will receive raw water from the Loiza River by means of a temporary 10 mgd. pumping installation, and deliver it to the present distribution system serving the San Juan area.

Work on the dam and reservoir will be launched shortly, and the construction of the series of installations will involve a $6,000,000 investment for these initial phases only. Nowhere else in the Caribbean area is there a water supply system on this scale and its completion, as the keystone of the entire Insular system, will solve one of Puerto Rico's most urgent domestic and economic problems.

The entire project, according to Sergio Cuevas, Administrator of the Porto Rican Aqueduct and Sewer Service, should be sufficient to meet all requirements of the crowded metropolitan areas well beyond 1975—a normal twenty-five year expansion.



San Juan's 30 Mgd. Loiza Filtration Plant
(Now nearing completion)

What this means to Puerto Rico may be hard to grasp on most of the mainland, where water is usually taken for granted. On the other hand, anyone who has traveled out of the States quickly learns to appreciate the value of pure water. When the government owned Puerto Rico Aqueduct & Sewer Service went into operation in December, 1944, it was confronted with enormous problems which were aggravated by unprecedented drought conditions, necessitating severe restrictions of water use.

Called upon to effect consolidation of administration and operation of the numerous aqueducts and sewer systems of the Island—not one of them then in condition to render good service—this organization has succeeded not only in greatly improving and extending all existing filtration plants and sewerage systems, but also in meeting the water quality standards of the United States Public Health Service.

San Juan's 48 in. Loiza Supply Line

(Now under construction. Each 16 ft. length of the locally produced concrete pressure pipe weighs 7 tons.)

Water Quality Improvements

How rapidly and successfully the water quality problem has been solved may be gauged from the fact that four years ago 40% of the water received no purification. Today 64% is completely purified, 23% is partially purified and 13% is supplied from sterilized deep wells. Today *no* water supplied the public is without some degree of purification treatment.

Water is now obtained chiefly from surface supplies, which are fully treated in 11 modern filtration plants throughout the Island. Of the 27 communities on the Island, 56 are supplied with surface water, while 21 get their water from deep wells. All water served to the public from filtration plants is checked by the Department of Health and meets the standards of the U.S. Public Health Service at all times.

Development of the water supply systems in their ultimate phases will involve an expenditure of around $25,000,000. In addition, the Aqueduct and Sewer Service has blueprinted a comprehensive sewerage system, especially for the crowded San Juan area, as well as in other heavily populated centers, and an additional $15,000,000 has been earmarked for a system of trunk line sewers, lateral sewers, a pumping plant, and a modern treatment plant of sufficient capacity to treat the sewage of the San Juan area for many years to come.

N. Y. Water Pollution Control Board Actions

Shortly after the appointment of A. F. Dappert as Executive Secretary, the New York State Water Pollution Control Board began work in earnest. Sixty-one letters were sent to municipalities which are discharging untreated sewage and do not yet have plans prepared for sewage treatment facilities. There are, of course, other cities which have no sewage treatment facilities, but these already have taken advantage of the opportunity to secure state aid in the preparation of plans.

In addition, twenty-six letters were sent to municipalities in need of major improvement or enlargement of sewage treatment facilities for which no plans have been made. The primary purpose of these letters was to point out the opportunity to secure State aid for planning purposes before April, 1950.

Under the direction of Charles C. Agar, Chief, Water Pollution Control Section, the first field studies of stream pollution in New York State were begun on September 19, on the Roundout-Wallkill watershed. Headquarters for these studies is at the Kingston Sewage Treatment Works.

Valve Manual

For Water & Sewage Works Operators

The Missouri Water and Sewerage Conference and the Missouri Div. of Health have published a **"Valve Manual"** of valve types used in water and sewage works practice. This manual was compiled by Vance C. Lischer, of Horner and Shifrin, Consulting Engrs., St. Louis, and represents the first of a series of manuals to be published by the organization. The plan for publishing these manuals is to use the regular issues of the *Journal* of the Missouri Water and Sewerage Conference. This particular manual represents the April and July issues of the *Journal*.

The bulletin contains 70 pages of information, data, pictures, tables, and diagrams on such topics as valve selection, valve maintenance, valve operators, and descriptions of valves, as well as an index to valve types.

This is a reference bulletin which should be in the hands of every consulting engineer and operator of water or sewage works. Copies of the "Valve Manual" may be obtained for $2.00 each from Warren A. Kramer, Secy.-Treas., Mo. Water and Sewerage Conf., Sixth Floor, State Office Bldg., Jefferson City, Mo.

Puerto Rico's Water & Sewer Systems Financed

The insular government of Puerto Rico has successfully concluded the permanent financing of its Aqueduct and Sewer Authority. Bonds in the amount of $21,998,676 were recently purchased by an underwriting syndicate in New York City. The Bonds were issued through the Puerto Rico Government Development Bank. Executive Director of the Aqueduct and Sewer Authority is Sergio Cuevas of San Juan, Puerto Rico.

WESTCHESTER WATER WORKS CONFERENCE AND OUTING

Ninth Annual Affair Features Main Tapping Contest

The Committee and Judges

L. to R.—Chas. Dedde, Supt., Chappaqua; A. E. Kassay, Supt., No. Tarrytown—Donor of Trophy; Wm. Jainnott, Supt., Thornwood; Arthur G. Jewell, Supt., Mt. Vernon; Irving Manahan, Supt. Pub. Wks., Briar Cliff Manor. Seated—Eric Hartman, Sales Engineer, Inertol Co., Newark, N.J., —(Dedde and Jewell were the committee in charge, Jainnott and Manahan were judges and Hartman was time keeper.)

ORGANIZED nine years ago for the purpose of mutual aid, the Westchester Water Works Conference in Westchester County, New York, served its purpose well during the war years. Since the end of the war the Conference has continued to exist, holding regular meetings at which technical papers are presented. Each year, too, an annual outing is held, this year on July 14. This year, as last, in addition to games, etc., a tapping contest was held.

Main Tapping Contest

The tapping contest was conducted by a committee headed by Chas. Dedde, Supt. of Water at Chappaqua, N.Y. Assisting on the committee were Arthur G. Jewell, Supt. of Water, Mt. Vernon, N.Y., and James Fitzgibbons, Supt. of Water, Yonkers, N.Y.

Rules for the contest permitted only one two-man team to compete from each water department. A water main under pressure was furnished by the Town of Greenburgh Water Dept. No preliminary preparation of the tapping site was allowed. The tap was for a ¾-in. connection and the contest was judged on the elapsed time and neatness of the job.

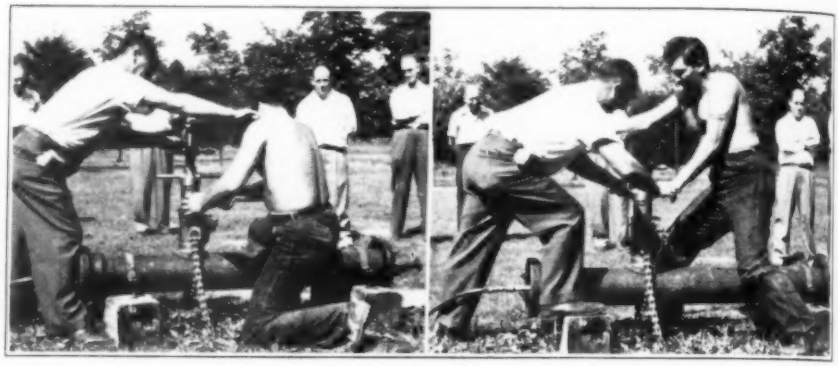
Judges for the contest were Wm. Jainnott, Supt. Thornwood Water Dept., and Irving Manahan, Supt. of Pub. Works, Briar Cliff Manor. Time keeper was Eric Hartman, Sales Engr., Inertol Paint Co.

The defending team from Peekskill did not enter the contest this year. The two teams which competed were Joseph Gulick and Nicholas Cassalaro from the Greenburgh Water Dept., and Pat Gabriele and Nick Iannarelli from the Westchester Joint Water Works in Mamaroneck, N.Y. The Greenburgh team won in an elapsed time of 6 min. and 8 sec.

The winners were presented the Kassay Trophy, donated by A. E. Kassay, chairman of the Conference and Supt. of Water and Sewerage, North Tarrytown, N.Y. Any team winning the trophy three times will be allowed to keep it.

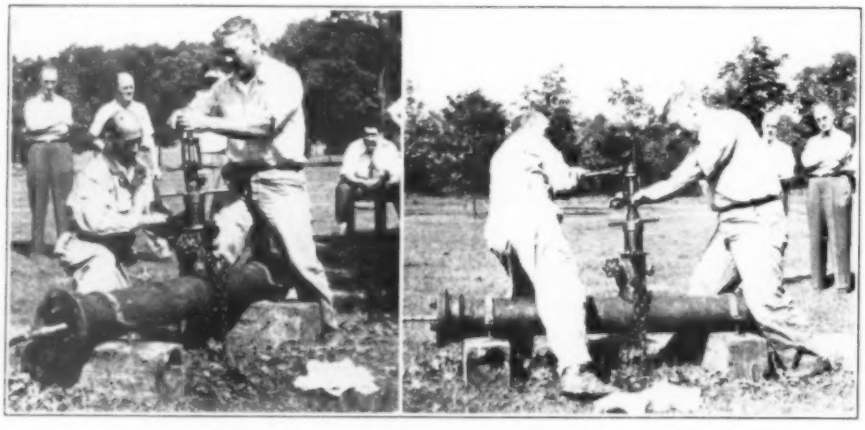
After the dinner, which was served out of doors, new officers for the year 1950 were elected. These included: Chairman—Wm. Jainnott, Supt. Thornwood Water Dist.; Directors—Jos. J. Cuirci, Ossining; V. A. Mascia, Mamaroneck; A. E. Kassay, No. Tarrytown; and Secretary—R. M. McLaughlin, Westchester Co. Health Dept., White Plains, N.Y.

Following the election of officers, the group was briefly addressed by Wallace Miller, Supt. Ossining, N.Y., and R. W. Blanchard, Neptune Meter Co., New York City. Both of these men spoke on membership in the American Water Works Assn. and the Public Relations Program of that organization.



Westchester Joint Water Works Team

(Pat Gabriele and Nick Iannarelli Tap a Pipe in 7 Min. and 37 Sec.)



The Winners in 6 Min. and 8 Sec.—Greenburgh Water Dept.

(Nicholas Cassalaro and Joseph Gulick)

And the Donor Awards the Trophy

(The winning contestants also each won a Mueller shower head.)

PRECONDITIONING AND DIGESTION OF SEWAGE SLUDGE

The Fifth of a Series of Articles from the Operator's Viewpoint

Gas Production, Sampling, Loading, Stage Digestion

by

T. R. HASELTINE
The Chester Engineers
PITTSBURGH, PENNA.

MOST laboratory investigations of sludge digestion problems use volumetric measurements of gas production as an indication of digestion progress; some also consider the variations in composition of the gas produced. There is no reason why those tools should not be just as valuable to plant operators. However, just total gas collection records alone will not be very helpful.

The Author

GAS PRODUCTION

We previously stated that a knowledge of the volume and solids content of the raw sludge was essential to the intelligent operation of digestion processes. With that knowledge, and meter readings of total gas production, it is possible to calculate the volume of gas produced per pound of volatile matter added to the digester. Table V shows such calculations made at Butler for 68 weeks during 1947-48, and 36 weeks during 1944-45. For brevity the table contains only averages for 4-week periods; however, we actually make the calculations for each week. During those periods daily gas production ranged between 10,000 and 36,000 cu. ft. per day. With the exception of last summer, however, we have always been able to collect at least 11 cu. ft. of gas per pound of volatile matter added to the primary digester. A five year average is 13.4 cu. ft.

Since our secondary digesters are not equipped for gas collection and, as previously discussed, typical sewage sludge yields only about 18 cu. ft. per pound of volatile matter digested, we feel confident that the digester is being operated as efficiently as possible. As previously explained, our trouble last summer was due to excessive mineral matter in the raw sludge caused by the return of a poor digester supernatant. The important point here is to understand that these same calculations would detect an upset in digestion due to any other cause just as clearly.

Personally, I have never taken advantage of gas analyses as a method of checking digester performance; however, Rudolfs,[21] Donaldson,[20] and Schlenz[12] report that any increase in the percentage of carbon dioxide indicates an approach of poor digestion conditions as much as a week before they show up in reduced gas production per pound of volatile matter added. At Durham, N. C., a continuous CO_2 recorder has been installed on gas lines from each digester. The idea seems worthy of adoption by others.

DIGESTER SAMPLING

While gas yields per pound of volatile matter added, constitute a good record of digester performance, it is highly desirable to detect poor conditions before they develop sufficiently to seriously affect gas production. Therefore, the digester conditions should be determined by regular samplings and laboratory analyses. Even if a record of gas analyses shows up

Table V

SUMMARY OF CALCULATIONS OF GAS PRODUCTION PER POUND OF VOLATILE SOLIDS ADDED TO DIGESTER—BUTLER, PA.

4 Week Period Ending	Fresh Sludge Pumped to Primary Digester					Gas Production, Cu. Ft.	
	Cu. Ft. per Day	% Solids	% Volatile	Total Solids lb. per day	Volatile Solids lb/day	Per Day	Per lb. Volatile Solids Added
2-22-47	717	4.37	77.5	1955	1515	21992	14.5
3-22-47	738	4.74	78.5	2085	1640	23599	14.4
4-19-47	789	4.45	75.8	2195	1665	24019	14.4
5-17-47	1229	4.72	64.8	3625	2350	28491	12.1
6-14-47	1703	5.05	61.1	5370	3285	25429	7.7
7-12-47	1856	4.40	62.0	5110	3165	27534	8.7
8- 9-47	1997	4.67	58.3	5830	3400	27687	8.1
9- 6-47	1923	4.72	57.8	5690	3290	28694	8.7
10- 4-47	1524	4.80	65.6	4570	3025	35103	11.6
11- 1-47	989	4.70	75.4	2945	2220	36013	16.2
11-29-47	903	5.00	73.9	2820	2085	32762	15.7
12-27-47	976	4.38	76.0	2670	2030	30988	15.3
1-24-48	797	4.52	77.5	2255	1750	26532	15.1
2-21-48	739	4.71	74.9	2175	1605	23661	14.8
3-20-48	603	4.66	73.5	1755	1290	20890	16.2
4-17-48	807	4.16	72.3	2100	1520	24607	16.2
5-15-48	1035	4.47	68.9	2885	1990	26123	13.1
8-12-44	1261	3.66	74.5	2880	2145	35248	16.4
9- 9-44	1412	3.68	73.4	3245	2380	35144	14.8
10- 7-44	1457	3.54	71.5	3220	2300	35118	15.3
11- 4-44	1367	3.52	72.0	3000	2160	32448	15.0
12- 2-44	1342	3.52	71.4	2850	2105	33476	15.9
12-30-44	1215	3.02	75.2	2285	1720	28114	16.3
1-27-45	1108	3.01	74.5	2080	1550	24185	15.6
2-24-45	920	3.60	74.9	2065	1545	22157	14.3
3-24-45	673	2.89	66.6	1215	810	10595	13.1

digestion troubles in advance, it can't show the cause of that trouble and so the samplings and analyses should be made.

Primary and single stage digestion tanks should be sampled at the bottom, as near the underside of the roof as possible, and at least at two or three intermediate points. Scum depth, if any, should be measured and recorded. Of course, temperatures should be determined at each sampling point. Each sample should then be tested in the laboratory for alkalinity, total solids, and volatile solids. As previously noted, I also run pH's but

withdrawal to drying beds or vacuum filter should be collected and tested for temperature, alkalinity total and volatile solids. The volume of such withdrawals should also be determined. In the case of the primary tanks of stage digestion systems, a record of daily volumes of material transferred to the secondary tanks, its temperature, and the point in the primary tank from which it was withdrawn, should be kept. These transfers should be sampled daily (or as often as transfers are made) and the individual samples composited in a refrigerator for weekly determination of depleting the sludge in the secondary digesters—all we could do was draw sludge as often as we had a drying bed available. At any event, changes in the secondary tanks are less rapid than in primary digesters.

Alkalinity Tests

Before leaving the subject of laboratory control, I might mention the method I have used for running sludge alkalinity. Standard Methods[21] calls for running it on 50 ml. of sludge supernatant, using 0.05N acid instead of the 0.02N specified for alkalinity determinations on water.

Sludge Digesters with Floating Covers at Cleveland, O.
(Note gas holder at right)

believe it to be a waste of time. If you so desire, substitute volatile acids, and perhaps ammonia nitrogen, for the alkalinity determinations.

Weekly Sampling

It has always been my practice to make these samplings and analyses once a week, although I have frequently thought that every other week would suffice. I understand that some operators of digesters handling heavy loadings of industrial carbohydrate wastes find it desirable to make the tests daily. At any event, the tests should be made frequently. If that is done, it will be found that the change in solids or alkalinity during the interval between tests will be more significant and of greater help in controlling the process than are the absolute values themselves.

In addition to these routine samplings and analyses, a sample of each

tions of alkalinity, total and volatile solids.

Perhaps it would be desirable to make the same detailed samplings and analyses throughout secondary digesters of two stage digestion systems. However, to be frank, I don't do it because it is too much work. I usually collect daily samples of the supernatant liquor, composite them for a week and then analyze them for solids and alkalinity. I also measure the temperature of the supernatant at least once a week. In addition, I sample each withdrawal to the drying beds and run the same tests on them, i.e. temperature, alkalinity total and volatile solids. If adequate sludge drying facilities are available, then measurements of sludge and liquor depths would be of value in regulating rates of withdrawal. At most of the plants with which I have had experience, however, there was never any question

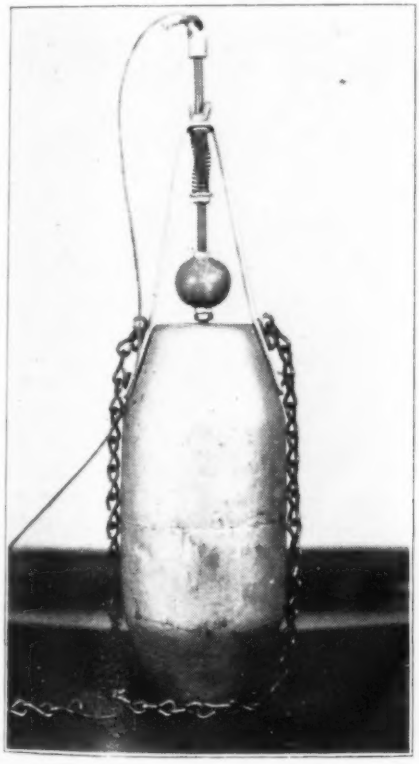
My chief objection to that procedure is the difficulty of getting 50 ml. of supernatant from a good thick sludge. To overcome that difficulty, I place 20 ml. of sludge and 80 ml. of distilled water in a closed vessel and shake the mixture violently so as to thoroughly wash the sludge solids. The mixture is then allowed to stand until 50 ml. of clear water can be drawn off, and run into a glass cylinder. Its alkalinity is then determined using 0.02N acid and the result is multiplied by five.

DIGESTER LOADINGS

Most states that have set up standards for checking the size and capacity of sludge digestion tanks base those standards on cubic feet of digestion space per capita of connected population. These standards[22] require (a) less volumetric capacity in heated

than in unheated tanks, thus recognizing the fact that proper control of temperature speeds up digestion; (b) larger volumetric capacity for plants utilizing trickling filters than for plants having only primary settling tanks, thus recognizing that if other conditions remain the same an increase in weight of dry solids to be digested requires an increase in digester capacity, and (c) larger volumetric capacity for plants utilizing the activated sludge process than for those utilizing trickling filters, thus recognizing that increases in volume of raw sludge due to higher moisture content requires increased digestion capacity even though the weight of dry solids to be digested may be no greater.

Thus it appears that the "loading" on a digester is a function of *both the weight of dry solids introduced and the volume of wet sludge introduced.* No entirely satisfactory single unit for measuring the loading on a digester has been devised. We can speak of increasing or decreasing that loading but we can't measure the change. R. S. Rankin, of the Dorr Co., has published a paper on this subject in *Sewage Works Journal*[25] and concluded that the volume of raw sludge feed and its detention in the digester bear a close relation to performance as measured by volatile matter reduction.



Sludge Sampler for Taking Depth Samples.
(Commercially available, with ball stopper both top and bottom, this sampler opens easily at any depth. Chain is marked in feet to determine depth of sample.)

STAGE DIGESTION

Perhaps we can illustrate the effect of increased loading by first assuming that we have a single stage digester operating at say 95°F., producing about 16 to 17 cu. ft. of gas per lb. of volatile matter added, a good clear supernatant liquor, there is no scum and the digested sludge as drawn to the drying beds contains about 8 per cent solids, 45 per cent volatile matter and has an alkalinity of 3,200 ppm. In other words, the digester is operating almost perfectly.

Now let us assume that without increasing the volume of raw sludge materially we suddenly increase the weight of volatile solids added to it. If the increase is not too great, there may be only a very slight increase in the volatile content of the digested sludge and a very slight decrease in gas production per pound of volatile matter added. However, there will be a very appreciable increase in total gas production. That increased gasification will stir up the entire contents of the tank. The solids in the digested sludge will decrease and those in the supernatant will increase; it becomes no longer possible to draw off a clear supernatant liquor.

If gasification is great enough, light sludge particles may be buoyed up to the top of the tank and then be unable to settle against the stream of rising gas bubbles; thus we have a thin layer of scum. Alkalinity may drop slightly, but still stay well above 2,000 ppm. throughout the tank. However, the tank remains at 95°F. and digestion is entirely satisfactory except that a good supernatant cannot be obtained.

Two-Stage Digestion

Such a condition would be unsatisfactory in a single stage digester but might be entirely acceptable in the primary tank of a two stage digestion system. The poor overflow liquor and/or the bottom sludge withdrawals could be transferred to the second tank. There only a relatively small amount of gas would be given off so solids could concentrate and settle out; the alkalinity would increase. The settling of the solids would produce a good heavy sludge for withdrawal to drying beds and a clear supernatant liquor would form at the top of the tank. This is the picture of an ideal two stage digestion system.

If the sludge drying facilities are too small, it will be necessary to allow the sludge to build up in the secondary tanks during poor drying weather. If that second tank becomes too full of sludge, it will be no longer possible to draw off a good supernatant, but of course that condition cannot be chargeable to excessive digester loading. If the sludge is stored in the secondary digester for too long a time, gasification will completely cease. The sludge will become dead; when drawn onto drying beds it will settle in a jelly like mass completely sealing the sand surface. Clear water will collect on top of the sludge instead of draining off through the sand, so drying time will be materially increased. This difficulty with stage digestion systems can be minimized by transferring some sludge from the bottom of the secondary tanks back to the primary tank. Of course the real solution is to increase sludge drying facilities so that sludge need not be stored for such long periods.

Gas Holder at Muncie, Ind.
(32-ft. diameter Hortonsphere built by Chicago Bridge and Iron Co. to store gas at 30 psi.)

Effects in First Stage

Now let's go back to the single, or primary stage, tank. If the increase in raw sludge volatile solids loading is further increased, all of the changes previously noted will be intensified. Both the total solids and their volatile content will increase enormously in the overflow liquor, much of the volatile matter will be washed out of the tank before it is completely digested, i.e. only the carbohydrates will have digested. Therefore, alkalinity will drop, the percentage of carbon dioxide in the gas will increase, and an acid condition may develop that will slow up digestion and thus make conditions even worse. If it is a single stage digester, the condition can only be corrected by reducing the loading or possibly by liming. If it is a primary tank of a two stage system, the condition can be controlled by frequent returns of material from the secondary digester back to the primary digester. In effect, this not only raises

the alkalinity of the primary tank, but actually reduces the loading on it by pushing more undigested volatile matter over to the second stage. As a result, more of the total gas production is released there, and less is produced in the primary stage.

Effects of High Moisture Raw Sludge

Now let us go back to our original, perfectly operating, single stage digester, but this time let's assume that instead of increasing the volatile solids content of the raw sludge we simply increase the volume of that sludge by adding excessive moisture. The additional water dilutes the bottom sludge to say 4 per cent solids instead of 8 per cent. This increases its volume and hence decreases the volume of clear liquor above it. At the same time the increase in volume of raw sludge introduced necessitates a corresponding increase in supernatant withdrawal. Soon there is no longer any clear liquor left and we again have a dirty supernatant—the first indication of an overloaded digester.

The continued withdrawal of excess amounts of poor supernatant gradually depletes the solids and ammonia nitrogen content of the tank. Its proportion of volatile to total solids increases, the sludge is less completely digested, alkalinity falls off, less total gas is produced, percentage of carbon dioxide in the gas increases, acid conditions develop, and in all respects, we are right back to the same poor conditions that resulted from increasing the weight of volatile solids. All of this could happen even if there were no drop in digestion temperature. Actually the increased volume of raw sludge would increase heat requirements. Quite possibly, the drop in gas production would make it impossible to satisfy those requirements; temperature would drop, digestion would slow up and so conditions would be even worse.

Importance of Solids Content and Sludge Volume

The foregoing should explain the importance of both dry volatile solids content, and wet sludge volumes, in considering digester loadings even though we do not have a unit for measuring those loadings. It should also be clear that much of the trouble resulting from overloading is due to a reduction in total solids in the digestion tank, particularly in the amount of nearly digested solids.

The greatest production of ammonia nitrogen, and hence alkalinity, occurs as digestion nears completion. If this digested sludge "balance wheel" is depleted by excessive withdrawals of sludge to drying beds or filters, then the same overloaded condition will develop in the digester, even though there has been no increase in either the volume, or the volatile solid content, of the raw sludge introduced.

It should now be clear why the operator must make the previously recommended frequent determinations of alkalinity, total, and volatile solids at various points throughout the depth of the digester, even though it is apparently operating satisfactorily at the moment.

Classification of Stage Digestion

Before leaving stage digestion I wish to point out that there are four general classifications of this system as follows:

1. *Both tanks arranged for heating and gas collection.* This is the most flexible system, and probably the ideal set up, as it can be operated either as a single two stage system or as two single stage tanks in parallel.

2. *Both tanks arranged for gas collection, but only the first tank heated.* With this set up parallel single stage operation is not practical. However, heat requirements are somewhat less. Operation is quite simple and good results are to be expected.

3. *Primary tank arranged for heating and gas collection; secondary tank uncovered and unheated.* Sometimes the secondary unit is actually a tank and sometimes it is an earth lagoon. Such systems frequently come into being either as an attempt to relieve an overloaded single stage unit as cheaply as possible, or as an attempt to economize on first cost of a new plant. If gas utilization is important, then very skillful operation is required to obtain maximum gas yields from the primary tank and still not get dead secondary sludge difficult to dry. If earth lagoons are used for secondary units, they should have sufficient piping so that their contents can be recirculated or returned to the primary units at will, otherwise they are not really secondary digesters but simply disposal areas for poor supernatant, etc. Desludging a lagoon is a difficult, expensive and disagreeable job.

4. *Uncovered and unheated primary units followed by secondary units arranged for heating and gas collection.* Such systems usually result from an attempt to provide additional digestion capacity for overloaded Imhoff tanks. The sludge compartment of the Imhoff tank serves as the primary unit. If much digestion takes place there, a considerable proportion of the gas yield will be lost. There may also be a tendency to develop acid conditions in the Imhoff tank. Sludge from the secondary digester cannot be returned to correct that acidity without impairing the quality of the Imhoff tank effluent. If little digestion takes place in the Imhoff tank, then the system becomes essentially a single stage digestion system with the secondary unit doing all the work. While I have had no first hand experience with such a system, I believe it to be the least desirable and the most difficult to operate of the four.

Regardless of what type of digestion facilities you have, the underlying priinciples of its operation are the same. I sincerely hope that the previous discussion of the "why" of the various operating procedures will assist you in operating it as efficiently as possible under the conditions prevailing at your particular plant.

*References**

(20) W. Donaldson, "Gas Collection from Imhoff Tanks." *Sewage Works Journal*, vol. 1, p. 608 (Oct. 1929).

(21) Wm. Rudolfs, et al, "New Jersey Agricultural Experiment Station," Annual Report of the Department of Sewage Disposal, 1923-24.

(22) "National Survey of Sewage Works Design Factors." *Sewage Works Engineering*, vol. 19, p. 119 (March 1948).

(23) Wm. Rudolfs, W. H. Baumgartner & L. R. Setter, "Effect of Coagulants on Sludge Digestion." *Sewage Works Journal*, vol. 4, p. 634 (July 1932).

(24) "Standard Methods for the Examination of Water and Sewage." 1946 Edition of American Public Health Association.

(25) R. S. Rankin, "Digester Capacity Requirements." *Sewage Works Journal*, vol. 20, p. 478 (1948).

*These references apply only to this part of the series.

Chlorine Tank Cars Are Not Rubber Lined

(A Correction)

H. A. Faber of the Chlorine Institute has justifiably called us to account for having printed a misstatement concerning single unit tank cars in our September issue.

In the article by Dr. A. P. Black "The Chemistry of Water Treatment" on page 328 there appears the statement "Chlorine is purchased in rubber lined tank cars which are held on a special siding in the plant until exhausted." All is correct in this statement except that chlorine is never shipped in *rubber lined* tank cars. Rubber lining is not required because liquid chlorine is a bone-dry product when loaded into plain steel cylinders or tank cars and therefore does not attack the metal.

We regret that this error was not caught in the editing of the article.

EFFECTS OF SEWAGE QUALITY AND CONDITION UPON PLANT OPERATION AND EFFICIENCY

And Some Remedial Measures to Improve Sewage Quality

by
ELSON T. KILLAM
Consulting Engineer
NEW YORK, N.Y.

STUDY of numerous plants indicates that few factors, other than those attributable to industrial wastes, have such predominating effects upon plant operation as does the condition or quality of the sewage upon arrival at the plant. The quality and condition of the raw sewage as it arrives at the treatment works has important effects upon operation, loadings, and efficiency of treatment plant units.

Stale and septic sewage imposes limitations and operational problems beyond the control of the operator, and remedial measures must be applied at the source; in other words, in the tributary system.

Such difficulties may most effectively be avoided or minimized at the time the tributary system is designed, but unfavorable conditions in existing systems may often be effectively improved.

Causes of Septic Conditions

Among the more common causes of septic conditions are the following:

1. Undesirably flat grades, small flows, uneven alignment and grades, and oversize pipe, all of which are reflected in the lodgment of organic deposits.
2. Oversize pump wells and pump suction arrangements that do not effect adequate dewatering of the well each time the pump operates.
3. Backflooding of main sewers, and reduced velocities, coincident with non-uniform flow, due to too high an elevation of high water in pump wells; due to surcharge from tidal outlets, or due to backflooding of secondary lines from overloaded main sewers.

Results of Foregoing Conditions

The foregoing conditions frequently cause rapid deterioration in sewage quality with important and undesirable consequences, including—

a) Disintegration and liquefaction of solids, with reduction of settleable suspended solids and increase in non-settleable and dissolved solids.
b) Increase in dissolved and non-settleable B.O.D.
c) Early gasification of solids.
d) Excessive hydrogen sulfide formation with attendant nuisance, deterioration of structures and equipment, or other difficulties.
e) Substantial increase in chlorine demand.

The Author

These undesirable changes in condition of sewage cause a reduction in the overall effectiveness and the efficiency of sedimentation; increase the loadings on, and cost of secondary treatment; frequently comprise the principal cause of odor nuisances; increase the cost of chlorination; and, in general, impair the overall efficiency attainable by treatment.

Remedial Measures in Existing Systems

Correction and improvement of conditions in existing systems may be accomplished by various methods.

In this connection it is pertinent to point out that (in a parallel with the ancient axiom of "one rotten apple in the barrel") a few focal points of development of septic conditions can be reflected in predominating changes in overall condition and quality of sewage from the entire tributary system.

In reverse, the correction of conditions of relatively limited scope may result in appreciable benefits.

Various measures which may prove helpful include the following:

1. A comprehensive and routine program of sewer flushing—at least in "trouble areas."
2. Use of flush tanks.
3. Introduction of stream flow at strategic points during dry weather flow periods.
4. Improvement and reduction of size of pump wells.
5. Regulation of range of pump well levels.
6. Prechlorination at "upstream" locations.

Precautions in the Design of New Systems

Among the more important considerations in the design of new sewerage systems are the following:

1. Strict adherence to adequate minimum grade standards.
2. Adoption of pumping for borderline cases.
3. Use of pipe with smooth interior and longer lengths in critical reaches.
4. Use smaller than normal pipe on short dead-ends—where limited flow is anticipated.
5. "Built in" provisions for flushing.
6. Use maximum care during construction to obtain best possible line and grade.
7. Provision of extra drop to maintain velocity at angle manholes.
8. Provide free drop where laterals join larger sewers.
9. Minimize velocity reductions where sizes change.
10. Provide multiple pump units or variable speed pumping, to maintain greatest possible continuity of station output, supplemented by provisions for periodic high velocity flushing.
11. Set pumps down to low water level in well and keep maximum water level below incoming sewer.
12. Avoid oversized force mains.

Reference to Specific Cases

Case (A):

In one study to determine the source of extensive odor complaints it was found that an old pump well—better described as a storage reservoir—increased the chlorine demand from 12 ppm. in the influent to over 30 ppm. as the sewage left the well. The excess chlorination cost for each 1 mgd. flow would amount to over $3,000 per year.

Case (B):

In the absence of certain industrial wastes, the proportion of total volatile solids designated by analysis as suspended volatiles, provides an important indication of the condition of the sewage, i.e., "Stale" or "Fresh."

If a high percentage of volatile solids are settleable, the removal of suspended solids will be high. Of greater importance, the removal of B.O.D. in the primary treatment units will be increased, with consequent reduction of load on the plant's secondary phases of treatment.

In a series of 24-hour tests of a group of sewerage systems in various parts of the country, it was found that the proportion of volatile suspended solids which were settleable, and therefore adaptable to effective treatment by sedimentation, varied from as high as 80 per cent to as low as 36 per cent.

The matter of grades in the tributary systems, the extent of the system, and sewage temperatures account for most of this wide variation in raw sewage character. If we assume that under average conditions approximately 60% of the suspended solids can be removed by sedimentation, it is obviously of basic importance whether 80% of the total organic solids are of a character susceptible to a 60% removal, or whether only 36% of the total are settleable to start with. In other words, 60% of 80% means a removal of 48% of the volatile solids in the first instance, as compared to but 60% of 36% or 22% in the latter case.

Every hundred pounds of B.O.D. that goes down in settleable form which otherwise, after being dissolved would go on to the filters, or to the activated sludge process, represents a very tangible increase in load on the secondary units of the plant.

The comparative conditions in these various systems may be summarized as follows:

System Designation	Description of Salient Features of Collecting System	% Total Volatile Solids Reported as Suspended
A	Small system serving 2,000 population—steep grades—short outfall	80%
B	Another small system in same municipality—similar conditions	76%
C	Small system serving 5,000 population—steep grades—short outfall	65%
D	Large system—serving 100,000 population—steep grades—high velocities in outfall	58%
E	Large system—moderate grades	56%
F	System serving 10,000—some flat grades	48%
G	System serving 8,000 population with some lines on flat grades	48%
H	System serving 8,000 population with large proportion on flat grades	36%

A Clear Cut Experience

In an investigation of a system serving three municipalities with an aggregate population of 60,000, there were indications that the plant was seriously overloaded. It was found, however, that the peak flows, even during extremely severe storms, seldom exceeded twice the average daily flow, and inasmuch as the system involved a long outfall with a low velocity, and there were evidences of septic sewage, a careful study was made of the collecting system and the condition of the raw sewage prior to developing any plans for plant enlargement.

Even in extremely cold weather the sewage was found to be highly septic, with high chlorine demands, excessive hydrogen sulfide content, gasification of sludge in the primary tanks, periodic development of offensive odors, and other undesirable conditions.

It was accordingly recommended that the program for enlargement and improvements be deferred until corrective methods were adopted in the tributary system in an attempt to improve the quality of the raw sewage.

The recommendations included:

a) Resumption of operation of a considerable number of old flush tanks in the system.

b) Establishment of a routine and comprehensive program of sewer flushing.

c) The regulation of pumping levels to avoid surcharge of incoming sewers.

d) Introduction of brook water into the system at times of dry weather flow in order to improve velocities in the main line.

e) Prechlorination.

With the cooperation of the officials of the cities involved, a striking improvement in raw sewage quality was brought about. In fact, the improvement was so pronounced that steps (d) and (e) have not as yet been found necessary.

It is of interest to note that tests prior to the adoption of corrective measures indicated a dissolved volatile content of 280 ppm. Since the corrective measures were instituted, for the past year the average value has been only 147 ppm. This is approximately one-half the dissolved volatile content prevailing prior to the adoption of remedial measures.

The improvement can also be measured by the fact that, for all practical purposes, hydrogen sulfide has been eliminated; the chlorine demand has been reduced by 50%; the development of gas and flotation of sludge in the primary tanks has been practically eliminated; the efficiency of primary sedimentation has been increased from 30% to over 50%, and the load on the trickling filters has been reduced by approximately 30%.

The foregoing examples and similar experience in other instances effectively demonstrates the desirability of careful consideration of design features which may affect sewage quality and indicates the potential effectiveness of remedial measures and "good housekeeping" on existing systems.

And What Now—"Mr. Chemist"?

"Ever since Uncle Harry brought him that chemistry set it's been nothing but complaints . . . now he claims there's not enough oxygen in the water for his Guppies."

(A cartoon of the "Grin and Bear It" series by Lichty—courtesy, Sun and Times Co.)

HURON, SO. DAK., TREATS SEWAGE AND PACKING HOUSE WASTE

by

E. H. DUNMIRE

Cons. Engr.

LINCOLN, NEBR.

THE City of Huron, So. Dak., with a present population of approximately 15,000, is located on the James River in the plains area of central South Dakota. The sewer system is a combined system, carrying storm-water run-off and sanitary sewage wastes from the city. There are no particular industries in the city; it has the ordinary domestic wastes plus the wastes from five creameries, two poultry processing plants, two soft drink bottling plants, five dry cleaning plants and three laundries.

The Author

Situation in Huron

Sewage flows by gravity to and through the plant, except where it is pumped to the final clarifier. The treatment plant is across the James River from the city, and the sewage is carried under the river by 10-inch and 16-inch cast iron pipe lines, operating as inverted siphons. There is a coarse bar screen on the city end of these siphons, which is cleaned by a float controlled Dorr bar screen rake. In addition to domestic sewage the plant receives and treats the wastes from the large Armour Packing Plant, located near it. The packing plant passes its sewage through a fine screen, mechanically cleaned, before it comes to the city operated treatment plant.

At the plant, there is a Parshall Flume-Meter on the city's raw sewage line and a similar one on the packing plant raw sewage line. The packing plant with an average daily kill of 400,000 lbs. of animals, contributes approximately 60 per cent of the flow, with the B.O.D. ranging up to 630 ppm. Weekly B.O.D. averages from 380 to 550 ppm., while the city contributes approximately 40 per cent of the flow, with a B.O.D. averaging 210 ppm.

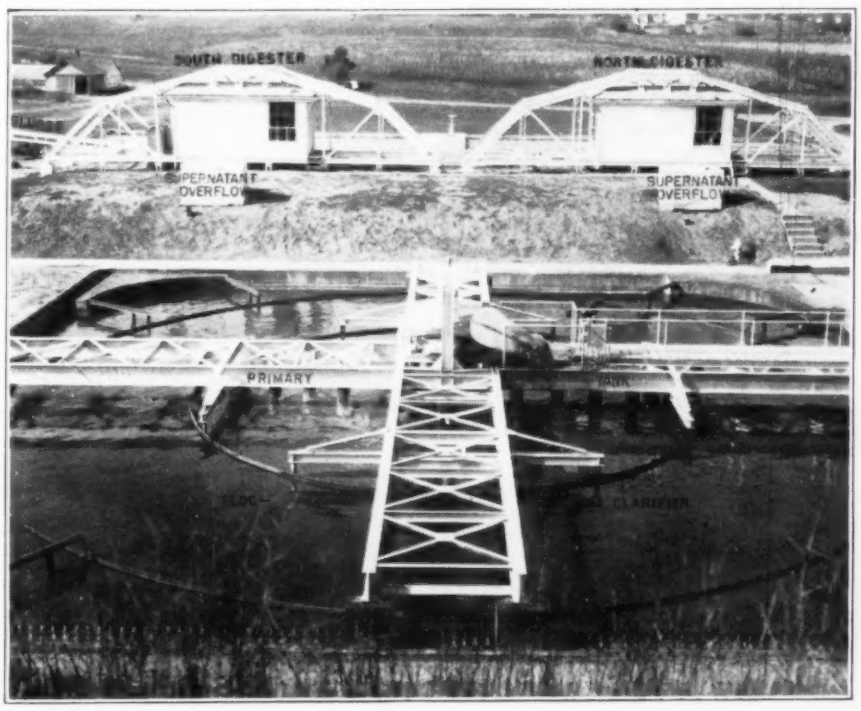
1932 Plant

In 1932, the city completed the construction of a sewage treatment plant, designed to treat a "2 mil. gal. per day with a maximum rate of 3 mil. gal. per day" of the mixed packing plant and city sewage. This plant was completed at a cost of $245,000.

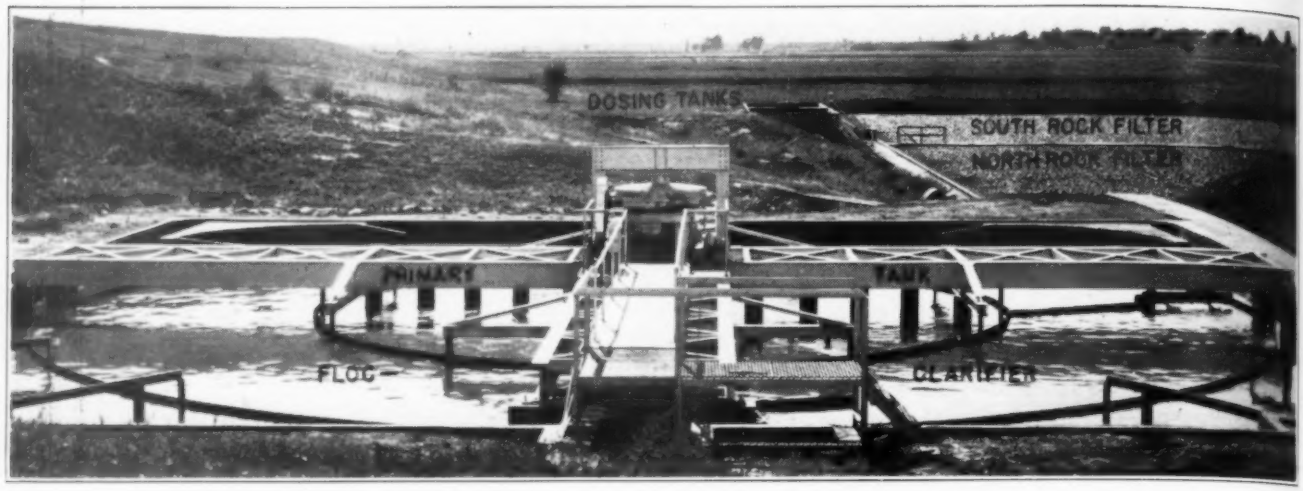
The plant as built in 1932 consisted of a mechanical cleaned bar screen, grit chamber and meter on the city raw sewage line and a mechanical cleaned fine screen and meter on the packing plant raw sewage line; a mixing chamber for the two flows; a 65 x 65 x 10 ft. SWD straight through flow primary clarifier, equipped with a Dorr Co. traction type clarifier; two dosing tanks, of 14,000 gal. capacity each; two uncovered trickling filters, 6 ft. depth of rock, of 0.61 acres area each (effluent direct to the James River); two 50 ft. dia. x 21 ft. deep, covered, buried and heated separate sludge digesters equipped with a Dorr Co. raker and scum breaker in each, with the supernatant liquor flow into the primary clarifier; five 25 x 50 ft. open-air sludge drying beds. The James River has no natural flow where the plant effluent enters, during the dry summer months.

First Year Troubles

In the first year of operation of this plant, 1933-1934, trouble began. The air lines in the dosing tanks froze solid, and the filter piping and the nozzles froze up, thus making the plant inoperable for weeks at a time. Only by covering the dosing tanks and removing the bleeder plugs from the mains could operation be restored. In the summer of 1934, during the drought, the James River, below the plant, became badly polluted, and the State Board of Health was requested to furnish the city with assistance. W. W. Towne, Director, Sanitary Division of the State Board, had tests made on the plant performance for several months. A pump of 1,200 gpm. had been installed in the original construction for recirculation of the filter effluent to the dosing tanks. This did not improve plant performance.



Primary Tank (Dorr Floc-Clarifier) with Sludge Digesters in Background



Primary Tank (Foreground) Looking Toward Trickling Filters

Tests disclosed that the mixed sewage flow had an average 5-day B.O.D. of approximately 550 ppm, the primary clarifier effluent averaged 365 ppm, (33.6 per cent B.O.D., reduction) and the filter or final effluent averaged 165 ppm., thus giving a plant performance of 70 B.O.D. reduction. After some six months of tests with this flow sheet and no improvement in plant performance, Mr. Towne recommended that construction be made so that the recirculated filter effluent could be returned to the inlet of the primary clarifier. This change was made and the plant performance improved, with a final effluent B.O.D. of 83 ppm., while the overall plant performance gave 85 per cent B.O.D. reduction.

By 1936 the growth of the city and the increased kill at the packing plant had increased the load on the sewage plant, so the city called on the State Board of Health for further tests and checking of plant operation. Complaints were filed by the property holders along the river below the plant and several suits were attempted. In March, 1941, a report on the sewage plant was made by engineers for the city. In May, 1941, the writer was employed by the city to make a complete report on the plant performance and the needed improvements to make it perform to acceptable operation standards.

1941 Changes

Studies and calculations made by the author in May, 1941, showed the following:—

(1) *Raw Sewage:* Average daily flow of 2.5 mil. gal., maximum 3 hour peak flow at a rate of 3.36 mgd., and an occasional 30 minute peak flow at a rate of 4.0 mgd. (siphons maximum capacity of 3.51 mgd. plus packing house flow.)

(2) *Grit Removal:* The three-channel grit chamber on the city raw sewage flow (each channel 2½ ft. deep x 2 ft. wide x 60 ft. long) gave only partial removal of the sand from the city flow, while the packing plant flow carried large quantities of fine sand with no means of removal.

A new grit chamber was constructed on the flow of the combined sewage beyond the mixing chamber. This was equipped with a Dorr Co. Detritor which very effectively removes all sand and grit from the sewage and washes it to less than 5 per cent of organic material content, leaving the sand clean and non-offensive to be scattered on the plant driveways.

(3) *Mixing Chamber:* The old raw sewage mixing chamber was retained, but the recirculated filter effluent was returned to it at a rate of 1.43 mgd., except during extreme peak flows.

(4) *Primary Clarifier:* The primary clarifier had a straight through flow and produced numerous short circuit currents which left portions of the tank as dead spots, where the sewage became septic and rose to the top. This septic condition in the tank was aggravated by the addition of the very septic supernatant flow from the digesters.

The tank was designed for a maximum flow rate of 3.0 mgd., (overflow rate of 710 gal. per sq. ft. per day) and a 50 to 60 per cent reduction of the B.O.D. The tank was receiving a flow of 3.36 mgd. at the three-hour peaks, overflow rate of 794 gal. per sq. ft. per day and producing less than 30 per cent reduction in the B.O.D. load. The mixed influent had a B.O.D. of 550 ppm. and the effluent B.O.D. was 365 ppm.

The old Dorr Co. traction type clarifier was removed and used in the new final clarifier. The supernatant liquor was diverted to flow into sludge lagoons. The size of the tank was not altered but the flow was changed to a center inlet and weirs were constructed for outlets on all four sides of the tank, with notched weir plates so that a very uniform flow throughout the tank was had at all flows.

The extreme corners of the square tank were filled and a new Dorr floc-clarifier was installed and has been used for four years without the use of any chemicals for flocculation. The recirculated filter effluent plus the raw sewage flow gave a maximum influent at a rate of 4.5 mgd., (overflow rate of 1,064 gal. per sq. ft.) per day, and B.O.D. reduction has been 70 per cent in this tank. (Influent with a B.O.D. of 550 ppm. and an effluent of 165 ppm.) All signs of septic sewage have disappeared in the tank and the improved tank effluent has produced very beneficial results on the filter beds.

(5) *Dosing Tanks:* The siphon interlocking air piping has all been removed and one of the tanks reduced in capacity from 14,000 to 7,000 gallons and an overflow adjustable weir valve installed so that any part or all of the flow can be diverted to one tank.

(6) *Rock Filters:* The 6 ft. deep rock filter beds of 0.61 acres area each, were designed for an intermittent dosing at a rate of 2 mil. gal. per acre per day. These filters were very badly clogged and ponded, requiring very frequent plowing. Large quantities of ice accumulated on them in the winter time. From 90 per cent to 100 per cent (in winter time) of the flow was thrown on one bed, which with the recirculated flow, gave a dosing rate of 7.85 mil. gal. per acre per day.

The previous operation of these filters was with a septic sewage influent of a B.O.D. of 365 ppm. and a resulting effluent of 165 ppm. (55 per

View of Trickling Filter, Pump House and Final Clarifier (In Rear) and Sludge Flume from Digesters to Lagoons in Distance
(Note sludge beds in foreground no longer used)

cent reduction of the B.O.D.) which went direct to the river. The new operation of these filters is with a sewage influent (no signs of septic condition) of a B.O.D. of 165 ppm. and a resulting effluent of 50 ppm. (70 per cent reduction of B.O.D.) At this higher rate of dosing and almost a continuous dosing the filter beds have cleared themselves of all signs of clogging and ponding and there is practically no accumulation of ice in the winter.

(7) *New Final Clarifier:* A new 65 ft. dia. x 10 ft. SWD final clarifier was constructed and the old traction type clarifier was installed in it. Pumps were installed and the effluent from the high rate dosed filter was pumped to the final clarifier. The effluent from the low rate dosed filter was returned for the recirculation flow to the mixing chamber by a separate pump.

The influent to this final clarifier at the three-hour peak of 3.36 mgd. produced an overflow rate of 1,010 gal. per sq. ft. per day. The influent with an average B.O.D. of 165 ppm. is reduced by the final clarifier to a perfectly clear effluent of an average B.O.D. of 19 ppm. and a dissolved oxygen content of 3-4 ppm. The sludge from the final clarifier flows by gravity to the recirculating pump sump.

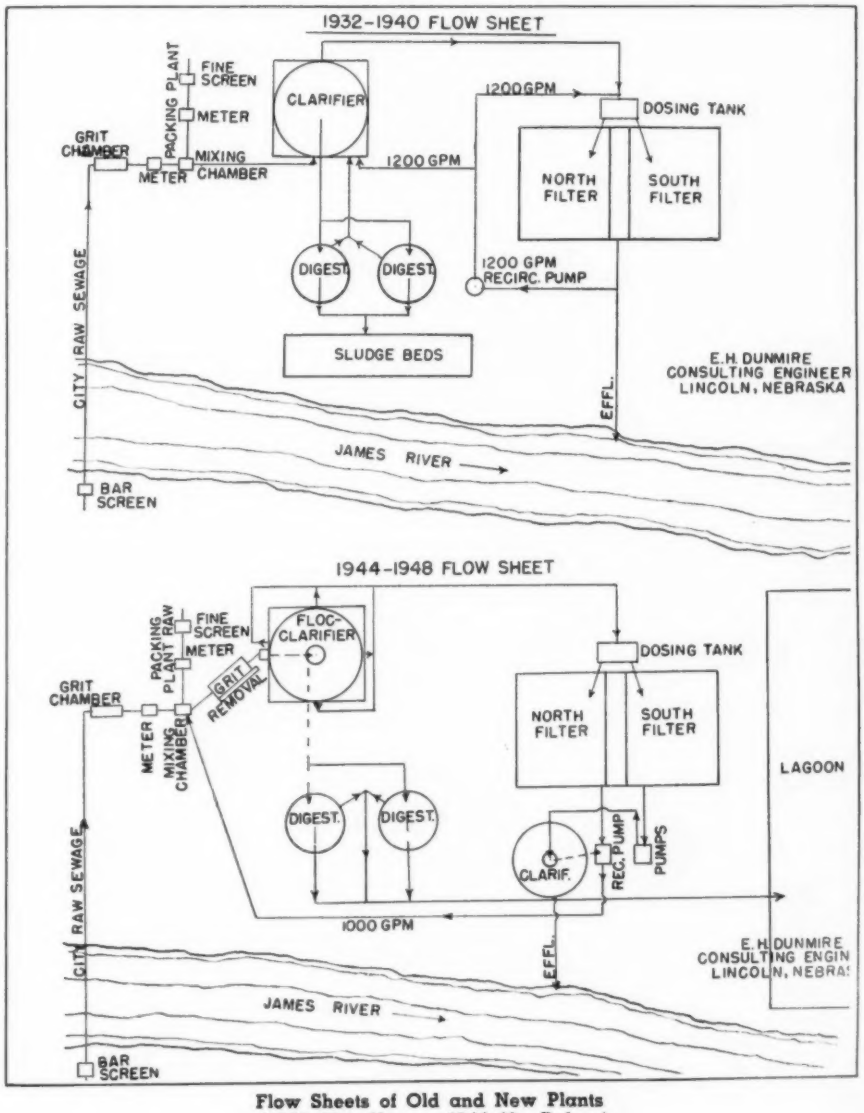
(8) *Sludge Digesters:* Changes to the two sludge digesters included:

(a) Digested sludge carried by a flume to lagoons near the plant. (b) the sludge piping was changed so as to permit series digestion and (c) the supernatant liquor overflow was reconstructed with adjustable pipe nipples with weir edges, to permit automatic overflow at any desired level and the liquor is emptied into the sludge flume and flows into the lagoons.

Cost of Improvements

These improvements to the sewage treatment plant were built during the war period, and completed in 1944 at a total cost of $56,000. In the accompanying flow sheets data for 1932-1940 operation and for the 1940-1948 operation are shown.

The table on the next page shows the comparative results accomplished by the different units of the plant and



Flow Sheets of Old and New Plants
(1932-40—Above; 1944-48—Below)

by the entire plant under the different methods of operation.

These data show the benefit of the floc-clarifier which accomplished a 70 per cent reduction in the primary with the recirculated filter effluent, as compared to the 49 per cent reduction in the primary clarifier with recirculation only, and to a 33.6 per cent reduction in the primary with a plain clarifier and no recirculation.

OPERATION DATA
PERIODS

Items	1932-1936	1936-1940	1944-1948
Raw Sewage, Mixed—B.O.D. in ppm.	550	550	550
Primary Clar. Effl.—B.O.D. in ppm.	365	281	165
B.O.D. Reduction %	33.6	49	70
Rock Filters, Dosing mgad.	2.0	2.0	7.85
Effl.—B.O.D. in ppm.	165	83	50
B.O.D. Reduction %	55	70	70
Recirculation Filt. Effl. gpm. to Final Clarifier Effl.	0	1,200 Prim. Clar.	1,000 Mix. Chamb.
B.O.D. Reduction %			19
Plant Effl. into River—B.O.D. in ppm.	165	83	19
Plant B.O.D. Reduction %	70	85	97

The author, as engineer, is not to be credited with all of the accomplishments in the performance of this plant, for the City of Huron is very fortunate in having a careful, ingenious operator, Alfred Ross, who has been capable of interpreting the analyses of the results, and effectively applying their interpretation to the better operation of the plant. Credit is due also to W. W. Towne and his assistants of the State Board of Health, who have always been very cooperative in testing and checking the performance of the plant operation.

Friel Appointed Drexel Trustee

Francis S. Friel, president of Albright & Friel, Inc., Consulting Engineers, of Philadelphia, Pa., has been appointed to the board of trustees of Drexel Institute of Technology at Philadelphia. In June Mr. Friel received the honorary degree of Doctor of Engineering from Drexel.

Roster Of Sanitary And Public Health Engineers

The American Public Health Association, in cooperation with the National Security Resources Board, is preparing a roster of sanitary and public health engineers of the United States. It is expected that this roster will supplement and bring up to date that prepared by the War Manpower Commission. The new roster is expected, also, to be of immediate interest to the National Security Resources Board as a means of providing trained sanitary and public health engineers for proper utilization of their professional training, should another national emergency arise.

The engineering section project of the A.P.H.A. is directly responsible for the collection of the data and preparation of the roster. It began a distribution of questionnaires on July 1st.

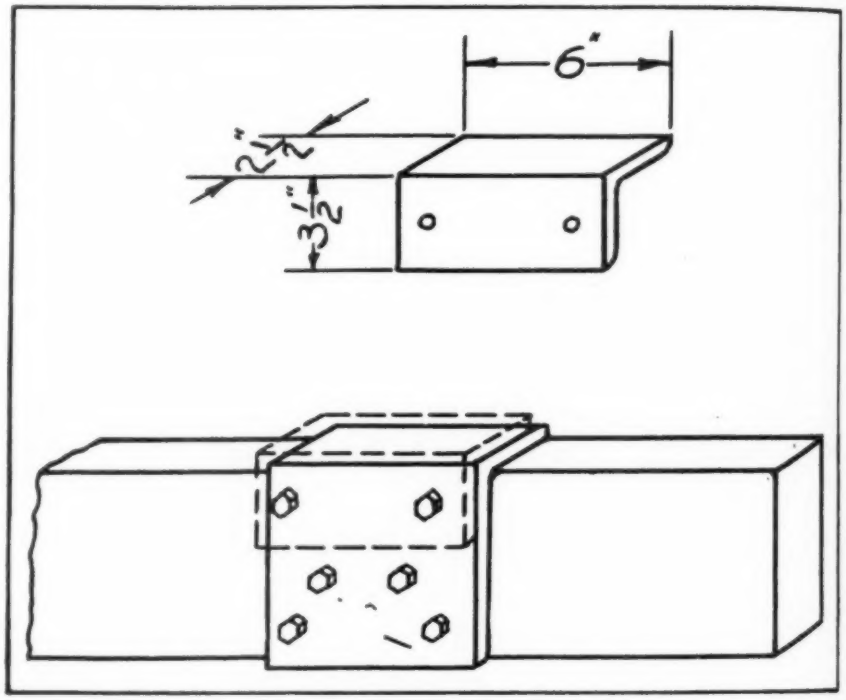
The definition of a sanitary engineer is that prepared by the National Research Council in 1943. Individuals will judge for themselves whether or not they meet the requirements as set forth in that definition.

The file of the War Manpower Commission, the list of engineers who served in the Sanitary Corps of the Army, and the membership lists of several national engineering societies are being used to obtain the names of those to receive questionnaires.

Any engineer who does not receive a copy of the questionnaire within the next two or three months should notify the engineering section project, A.P.H.A., 1790 Broadway, New York, so his name can be entered in a master file and a questionnaire sent him.

REPAIRING FLIGHT WEARING SHOES IN SETTLING TANKS

by
Nicholas Herda*



In due course of continuous operation of sludge removal flights in longitudinal settling tanks, the flight wearing shoes wear out. Replacing these worn shoes can be relatively expensive. The first total material and installation cost of these shoes on thirteen flights each in four tanks was more than $200 about four years ago. In an effort to reduce this cost, when these shoes had to be replaced recently, we devised an angle iron shoe as shown in the accompanying sketch.

These shoes are standard stock angle iron, and are installed over the original wearing shoe. It required only about eight hours to install the 104 shoes in four tanks. It was not necessary to dewater the tanks. The cost of materials and labor was $76, or $19 per tank, or about one third of the original cost of installation.

*Supt. of Utilities, Ypsilanti Township, Michigan.

HOW METALLIZING IS USED IN WATER AND SEWAGE WORKS

by
RICK MANSELL
B.Sc., A.R.C. Sc., A.I.C.
Process Engineer
LOS ANGELES, CALIF.

THE protection of steel surfaces from the ravages of corrosion is a major industrial problem—its significance is particularly encountered in the operation of water and sewage works. It is a well established fact that steel does not corrode in perfectly dry air, since the process involves the dissolving of the metal by the action of water. To prevent corrosion, it is therefore only necessary to apply a coating over the steel which is itself impervious to moisture.

Under the continued attack of moisture and other elements in the atmosphere, the usual types of paint coatings often do not possess sufficient impermeability and abrasion resistance. When they are employed continued recoating at regular intervals is necessary and this is accompanied by expensive surface preparation to ensure the required adhesion of the coating to the base surface. For these reasons the use of metal protective coatings has been developed.

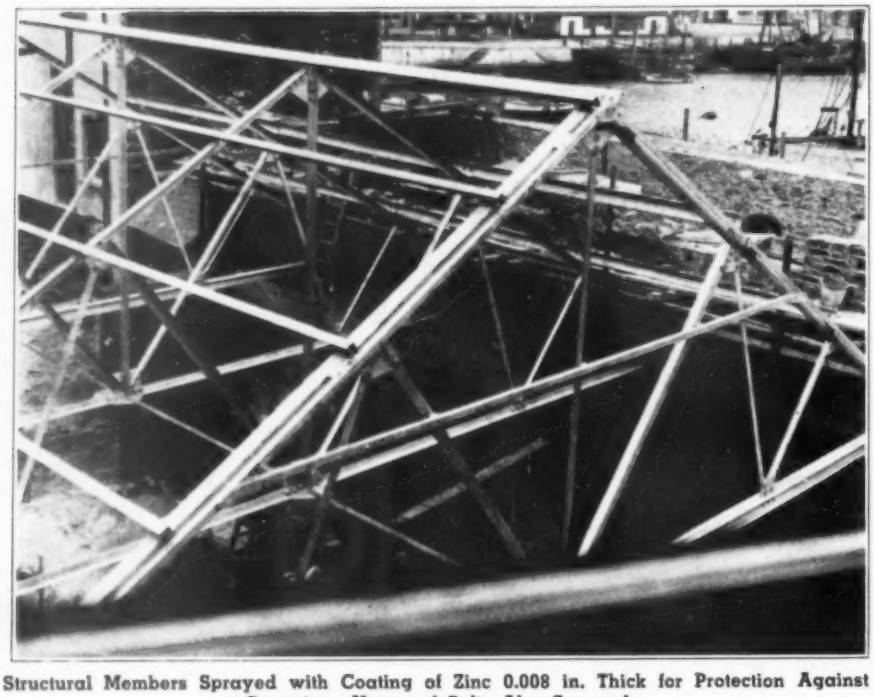
Metals differ widely in their protective ability on steel surfaces because of the variations in their "electrode potentials." When a metal is immersed in a solution of an electrolyte, it exerts a pressure as a result of its normal tendency to pass into its "ionic" state. This tendency is called the "solution pressure" of the metal, and when two dissimilar metals are placed in the same electrolyte, the one with the greater natural solution pressure dissolves first and, in so doing, it protects the other one from the corrosive attack.

The familiar electromotive series of metals lists them in the order of their electrode protentials and shows nearly the same information as the order of solution pressures. The electrode potentials show the difference of potential existing at the interface between any metal and a solution of the same metal in which it is immersed. Measured in volts, silver shows a positive potential of .80 and copper is .35 while lead shows a negative potential of .13, tin is .15, nickel is .20, iron is .34, cadmium is .42, chromium is .47, zinc is .77, aluminum is 1.34, and magnesium is 1.8. The silver and copper are electropositive to the hydrogen electrode while all other metals listed are electronegative.

When these metals are immersed in the same electrolyte, the more *electronegative* metal acts as the cathode and goes into solution first. Therefore, those later in the list will corrode or pass into solution before the earlier ones. An examination of the positions of the metals relative to iron explain the familiar behaviour of the metals used to protect it. When iron and zinc are together in the presence of moisture, the zinc dissolves first and, in doing so, protects the iron. All the metals following iron in the series, being electronegative to iron, protect it by a sacrificial action.

The metals previous to iron in the above list are only used to protect it, when a heavy impervious coating can be applied, as in machine element work. Stainless steel is used quite extensively for pump shafts, where a thick coating can be built up of this material which possesses high corrosive resistance. Since only relatively thin coatings can be practically applied to large areas as tanks and structures, such metals as brass, bronze, nickel, stainless steel, tin and copper cannot be used as protective coatings applied by metallizing.

Spraying Diffuser Plate Holders with Zinc
Note compact metallizing gun in operator's left hand.



Structural Members Sprayed with Coating of Zinc 0.008 in. Thick for Protection Against Corrosion. Nuts and Bolts Also Sprayed.

From the very nature of the sprayed metal, it can be seen that a perfectly impervious coating is almost impossible to apply and hence those metals being electropositive to the iron will initiate corrosion in the presence of moisture. Peening or buffing the surface may reduce the porosity and increase the impermeability, but this improvement is not sufficient to permit these electropositive metals to be used for the corrosion protection of iron exposed to severe conditions, unless a very thick film of them can be applied in a convenient way.

For these reasons, metals which are electronegative to iron are used extensively in the field of corrosion protection. Aluminum, zinc and cadmium are selected because they are anodic to the iron and steel surfaces. Zinc is the metal most commonly used because of its efficiency and its low cost. Aluminum requires a better job of surface preparation by grit blasting than does zinc; also zinc penetrates better than aluminum into the less accessible corners and areas.

Use of Zinc and Aluminum for Corrosion Protection

Both sprayed aluminum and zinc offer excellent protection to the steel without being painted. However, in order to obtain the maximum advantage from the protective value of the coatings, it is recommended that they be painted, using impervious materials. In addition, the appearance is greatly improved and enables large surfaces to blend in harmoniously with the surroundings. In cases where a heavy blast job cannot be readily obtained, it may be more economical and convenient to apply a thinner sprayed metal coating and then reinforce it with paint. As a general rule, it is found that aluminum provides a better base for paint than does the zinc, although unlike the hot-dipped coating sprayed zinc gives satisfactory adhesion to organic films.

For use in industrial atmospheres and in cases where salt spray or salt fog is encountered, aluminum is generally more durable than zinc. For maximum protection and a minimum of maintenance, and where a painted surface is not required for the sake of appearance, a coat of aluminum of thickness between .010 to .012-in. may be applied. Such a coating could be expected to give about fifteen years of protection. A similar period of protection can be duplicated by the use of .007-in. of aluminum reinforced by a coat of paint. If repainting is done regularly, the life of the aluminum coating will continue indefinitely and a maximum protection to the base steel surface will have been achieved.

In rural atmospheres where corrosive fumes and gases are absent and there is not excessive humidity of a continuous nature, zinc coatings have given very excellent service and are preferable to aluminum. Thinner coatings may be used with zinc and there is less danger of corrosion at those places where the coating is thin due to inaccessibility. In spite of the fact that aluminum is lower down in the metal series referred to earlier, the observed protection is not equal to that which its position might indicate. This is because of the fact that as aluminum corrodes it is itself protected by an adhering film of aluminum oxide and this prevents the aluminum metal from exerting its anodic protection to the iron, in a complete fashion.

In addition, the adhesion of the zinc is better on those surfaces which are not prepared in an ideal fashion and is usually lower in cost if painting for decorative purposes does not have to be performed. A coating of zinc which is .005-in. thick would be expected to last twenty years under mild conditions of exposure. Damper and more severe conditions of exposure will require thicker coatings if maximum life is required. Zinc chromate priming paints, based on a synthetic vehicle, followed by a phenolic-alkyd finishing paint, have given remarkably durable results under the most adverse conditions of exposure.

Examples Showing Use of Sprayed Zinc

A good example of the use of "Metallizing" is the case of a wash water tank for the filter units that manifested heavy corrosion after 18 months of operation. The continuous service of this 110,000 gallon tank was essential to the efficient operation of the plant and the thought of having to remove it from service every 18 months for painting was very unpopular. The tank was open top, 32 feet in diameter by 19¼ feet deep. Only enough of the area was sandblasted each day so as to permit the application of two coats of sprayed zinc. In this way, a completed surface was produced every day, which would not be affected by the dust created by subsequent blasting on the adjoining areas.

A coating of zinc .006-in. thick was built up and this required about three weeks to complete. The metallized surface was intermittently exposed to water and air in accordance with the usual plant operations. From one-third to nearly all of the side wall surface is exposed to air at least once a day, for periods of from 15 minutes to one hour. Although the metallizing job was three times as expensive as a good paint job, the fact that it permits continuous operation as a result of its increased corrosion protection, more than justifies the additional expenditure.

Another example is the case of an elevated water tank, with a four foot diameter riser pipe, that had a serious condition of corrosion inside it. The steel plates were corroded in places to a depth of over ⅛ of an inch. This was remedied by metallizing the in-

side with .016-in. of zinc. (The outside surfaces were metallized with a coating of .012 aluminum.) After several years of service, the tank was drained and all scale and sediment which had accumulated inside the tank and riser pipe were removed. This amounted to less than ¾ of a bushel. All the outside surfaces, including the rivet heads, were in perfect condition.

The steel troughs at one company's filter plant had been in service for 22 years, and during this time the scraping and painting of the troughs had been carried out every two years, since this was the maximum life of the available organic coatings. Considerably longer service was obtained by metallizing them with .006-in. of zinc, applied in two coats, to a surface prepared by steel grit blasting. Several of the troughs had been so deeply pitted that small holes had penetrated through the metal. These holes were filled with sprayed metal, thus restoring to use troughs which otherwise would have had to be discarded.

Steel tanks of a Permutit Water Softener after 13 years of operation revealed serious pitting on the interior surfaces, especially at the riveted seams. Caulking and exterior welding had been used to stop some of the leaks, but the real villain of the piece was corrosion. This was corrected by blasting the tanks clean with steel grit and then applying .008-in. of zinc, paying particular attention to the riveted areas, where additional metal was used. Since this treatment, all the seam leaks were stopped and the corrosion trouble overcome.

There are many other applications in which the use of sprayed zinc has been able to remedy the corrosive influences encountered at water works. The plug valves in the floors of coagulating basins are operated from the roof by steel rods 22 feet long. These are treated with .006-in. of zinc. Steel ladders in basins and reservoirs, brace rods exposed to constant moisture or complete submersion, sluice gates and other surfaces subject to deterioration when left uncoated, all have their service life considerably increased by metallizing.

Use of Sprayed Zinc in Sewage Works

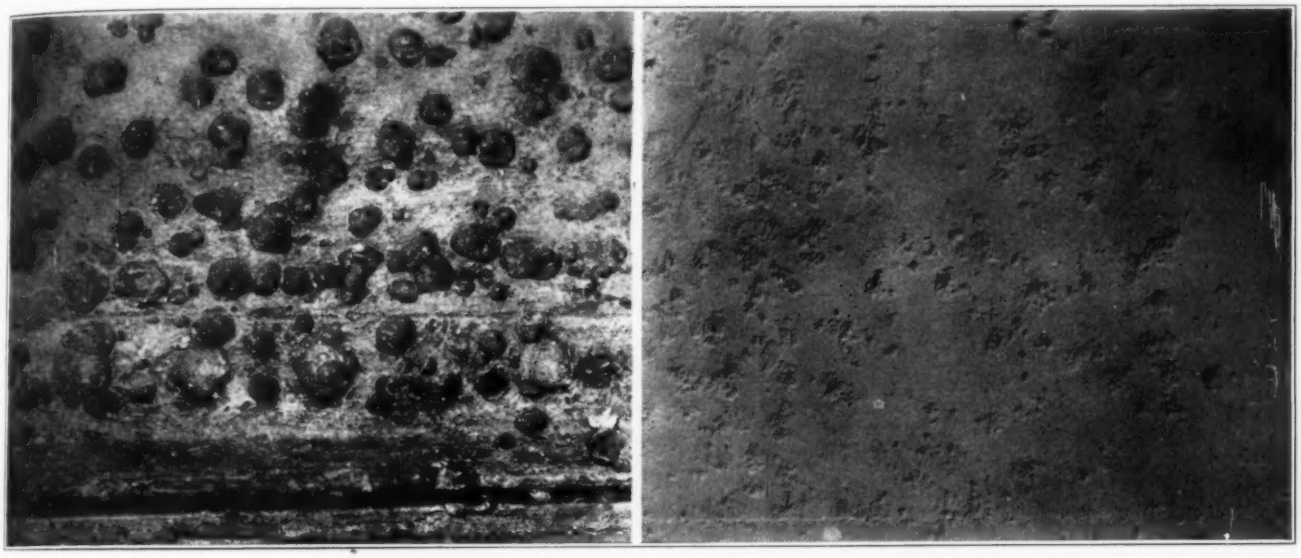
The disposal of sewage by the "activated sludge process" is responsible for exceptionally severe corrosion on the many thousands of cast-iron air diffuser trays immersed in the liquor in the aeration tanks. Each tray is divided by bridges into four or six pockets, and the central bridge has a tapped hole for a compressed air connection. The compressed air passes into the liquid through a porous plate of insoluble material and hence forms millions of minute bubbles which aerate the liquor and provide oxygen to support the life of bacteria in the sludge. The weak link in this system is the diffuser tray which is immersed and intermittently exposed to compressed air. The inspection and scrapping of these was a continuous job and the cost of replacement was extremely high. By metallizing the inner faces of the diffuser trays with .005-in. of zinc, the effective life was increased enormously. A new cast iron tray weighs about 40 lbs. and about 4 oz. per sq. ft. of zinc is applied to it, i.e. about one pound of zinc per tray. There are a large number of other corrosion problems in the modern sewage plant which are overcome by metal spraying. An example is the steel work of the heat exchangers where the engine exhaust is utilized to warm the sludge for the digestion tanks, to assist in the activation of the digestive bacteria.

Metal Spraying for Mechanical Maintenance

In addition to its outstanding protection to metal surfaces against corrosive influences, metallizing has established itself in the field of mechanical maintenance. Expensive machine parts, turned shafts, crankshafts, turbine elements, transmissions, impellers, conveyors, propellers, spindles, piston rods, pump rods, axles and a wide range of other machine parts subjected to mechanical wear are readily restored to their original dimensions by metal spraying. In addition, the resurfacing can be performed with metals possessing even greater hardness and wear resistance than the base metals.

Many steel and bronze valve rods and stems with worn or scored surfaces have been rebuilt by metallizing. The repaired items are in many cases more serviceable and can stand more wear than the original. In one plant, the impeller shaft of an 8 M.G. per day centrifugal pump was restored to its normal operating size using stainless steel.

In the same plant, eight feed water pump plungers, constructed of grey cast iron, 6-in. in diameter and 19-in. long, showed considerable wear and noticeable scoring after two years' operation. It was actually impossible to keep the packing glands tight and they had to be rebuilt with stainless steel. A full 1/16-in. was machined off the surface of the plunger for the entire length of the stroke, and the new surface prepared for spraying so as to give a good bonding. The plunger was revolved in a lathe and the spray gun



Section of Steel Plate Before and After Sandblasting and Metallizing With Zinc.

was attached to the tool carriage. Thin layers of steel were applied by the back and forth movement of the carriage until the new metal had reached the thickness equal to .020-in. oversize, and was then ground smooth to the exact dimensions. After three years' service, the plunger is free from wear, the original packing is still in the glands, and the gland nuts have never been tightened. Other plants have used a thin coating of stainless steel to check the corrosion and to reduce the wear and friction on ordinary steel pistons and piston rods. Cast iron valve bodies may be metallized at a reasonable cost and cavitation prevented. Likewise, worn and pitted parts may be built up like new.

How the "Metallizing" Process was Developed

The idea of spraying an atomized stream of molten metal upon a surface so as to produce a metallic coating upon that surface occurred to Dr. M. H. Schoop of Zurich, Switzerland, in 1909.

The original metal spraying gun utilizing wire was developed before the first world war. It was really a fine mechanical piece of work; so much so, that the basis of operation of the modern wire gun remains substantially the same as the original design.

The first application of metal spraying was as a means of protecting surfaces against various types of corrosion. Before 1930 the process now known as "Metallizing" was used more extensively in Europe than in the United States. However, since that date the use of metal spraying has rapidly increased in our country, until today it is an important factor in almost every branch of our industrial operations. Its main advantage is its portability.

Metallizing has firmly established itself in the mechanical fields. There is an ease and speed with which machine element parts can be repaired or reclaimed. The savings involved are considerable, and furthermore, it has been demonstrated that the properties of the sprayed metal coating are, in most cases, actually superior to the base metal in its wearing qualities, even though it may be of a similar composition. Again, metallizing has been used to coat an expensive metal over a more common metal base, so as to produce the properties of this expensive metal without having to employ it, as a solid core.

The Metallizing Operation

The metallizing operation is fairly simple to follow. A continuous wire of the desired composition is fed into the rear of the metallizing gun. It is propelled forward toward the nozzle of the gun by means of compressed air actuated turbines. As soon as the wire emerges from the gun nozzle, it is melted by an oxy-gas flame. This molten metal is then atomized by compressed air and projected against the surface. When it contacts this surface it cools instantly, and then adheres firmly to the prepared surface.

The metallizing gun is a small, lightweight device, consisting of a power unit and a combustion unit both united in a single assembly. The wire is fed through the power unit at a uniform speed into the combustion chamber. When it reaches the apex of the oxy-gas flame, it is there instantly reduced to the molten state. A concentric air blast projects the molten metal at a high velocity against the surface being coated, and this helps to form a strong coherent coating. Since metallizing is a continuous operation, the coating can be built up to any predetermined thickness.

For wear resistant coatings, Tufton steel or 1.20 carbon steel are recommended. For those cases where severe corrosion conditions are encountered, then No. 1 stainless steel (18-8) is used; this must be polished after spraying. For general atmospheric and cold water corrosion on steel, high purity zinc is used. For the protection of metals exposed to elevated temperatures, the aluminizing process is used.

Metallizing will outlast welding in many cases. Furthermore, metallizing is generally faster. There is only one set-up in the lathe; the shaft is undercut, metallized, and machined in sequence. A metallizing gun will apply steel at the rate of about 10 pounds per hour while an electric welder can only apply five pounds per hour. In addition, only 1/32 inch is all that is necessary to allow for machining in the case of metallizing operations, while with welding it is generally necessary to build about ¼ inch oversize.

Some Salient Features

Some of the salient features of the "Metallizing" process can be expressed in the following four points. In the first place, there is no possibility of heating the surface being metallized to the point where warpage, crystallization, or heat stresses occur. Secondly, there is the ease with which any metal commercially obtainable in the form of wire can be handled. Also, there is the facility with which dissimilar metals can be applied.

In the third place, there is the ease with which many jobs can be done "in situ," and this eliminates the delay and expense of complete dismantling. Finally, the versatility of metallizing enables it to be used with metals ranging from lead to the alloy steels; also it can be used on jobs ranging from building up armature shafts to the coating of rotary kilns with aluminum and the protection of water tanks with zinc.

For all these reasons, the metallizing process for building up worn surfaces and for applying corrosion-resistant coatings is in daily use in some two thousand plants throughout the country. It eliminates costly shutdown periods, and effects drastic reductions in mechanical maintenance costs. Repair and the salvage of equipment can be performed with amazing facility.

Acknowledgement: The photographs used to illustrate this article were supplied to the writer by the Metallizing Engineering Co. of Long Island City, N. Y.

L. M. FISHER JOINS A.P.H.A. AS ENGINEERING FIELD ASSOCIATE

Lawrence M. (Larry) Fisher has retired from the U.S.P.H.S. after 34 years' service and has joined the American Public Health Assn. staff, as Engineering Field Associate. In this capacity he replaces Wm. T. Ingram who resigned the position in May to become Assoc. Prof. of Sanitary Engineering at New York University.

Mr. Fisher's work will consist of carrying on the Engineering Section project, with special attention being given to the Engr. Section research studies, use of the sanitation evaluation schedule and development of the Roster of Sanitary and Public Health Engineers.

Mr. Fisher's most recent work with the U.S.P.H.S. included the U. S. Chairmanship of the Technical Advisory Board of the International Joint Boundary Water Commission, which has released its report on the Detroit area and is now working on the Buffalo-Niagara Falls area. He was also a member of the Potomac River Basin Commission and of the U.S.-Mexico Commission on the Rio Grande River.

SMALL CITY COMBINED WATER AND SEWAGE MANAGEMENT EFFECTIVE

Sullivan, Ill., Has Set Good Example Since 1936

by
JOHN E. WINSKILL*
Superintendent
WATER AND SEWAGE WORKS
SULLIVAN, ILL.

IN THE heart of central Illinois' fabulous farm land lies Sullivan, county seat of Moultrie County, most of which lies in the valley of the Kaskaskia (or Okaw) River. The City of Sullivan, however, is some six or seven miles from the river proper with only small Asa Creek running through it. This creek is far too small to serve as a water supply or as a means of disposal of sewage.

Founded before the war between the states, early water supplies were from private wells or local municipal wells. In 1927, two modern gravel walled wells were located some 2½ miles from the city. These wells, 18 inches, were put down 115 ft. into a preglacial valley of the Kaskaskia River. The watershed area above the location approximates some 700 sq. mi., and the underground drainage of practically the entire watershed is available as a source of supply.

*As told to George E. Symons, Assoc. Editor, *Water & Sewage Works*, by Mr. Winskill, and supplemented with information furnished by R. P. Blystone, former Supt.

The Author

Motor-driven deep well centrifugal pumps were installed, discharging into a 10-inch supply main to the 100,000 gal. elevated storage tank in the city. Hardness of the water supply was 288 ppm.[1] Population was approximately 2,300 persons.

Prior to 1930 the city had been decreasing in population but in that year a Brown Shoe Factory opened and employed some 500 persons, and a steady growth followed. By 1935 the population was 3,000, and the water had a hardness of 391 ppm. with more than 0.5 ppm. of iron. About that time local sentiment began to crystallize toward softening the water supply and providing sewage treatment for the city.

Survey of Public Opinion

In order to ascertain the attitude of the voting public toward the two proposals to improve the water supply and provide sewage treatment, a survey was made of all residents in the city. A copy of the survey questionnaire is shown in Fig. 1.

Table I shows a summary of the information collected from that survey. It is of interest to note that only 4.5 per cent of the persons interviewed refused to reply to any questions, and only 4.8 per cent of the persons interviewed were unfavorable, while 21.4 per cent (mostly well water users) declined to answer question No. 6, only because they were not city water users, but they indicated generally that they would pay the higher prices if the water and sewage service became available.

Water Softening Plant at Sullivan, Ill.
(Left—Settling basin; Center—Filter Plant; Right—Well)

INDEX NO. ..... CARD NO.....

SURVEY OF CITY OF SULLIVAN

NAME .....

ADDRESS .....

No. in family .....

Occupation of wage earners..... Employed ( ) Unemployed ( )

Do you own your own home? Yes ( ) No ( )

Do You own other improved city real estate? Yes ( ) No ( )

No. of rooms (in house) ..... Bathrooms ( ) Rooms ( )

Have you any of the following:

Stationery wash tubs .....Yes ( ) No ( )

Basement Drain ..... Yes ( ) No ( )

Bath tub .....Yes ( ) No ( )

Shower ..... Yes ( ) No ( )

Flushing Lavatory ..... Yes( ) No ( )

Kitchen Sink ..... Yes ( ) No ( )

Do you have trouble keeping basement dry at all times? Yes ( ) No ( )

Source of water supply ..... City ( ) Well ( ) Both ( ) Cistern ( )

Gallons used per month (.....)

Use now—(If more than one mark both). Septic Tank ( ) Sewer ( ) Cesspool ( ) Outhouse ( )

The following facts are being given to enable you to better answer the next questions.

FIRST: The construction work would give employment to approximately 110 persons for nine months and bring a payroll to Sullivan during this period of $78,955.00.

SECOND: Last year the City paid $9,225.00 in principal and interest on the water certificates outstanding. The annual cost of principal and interest on the combined system, calling the above certificates, would only be $1,775.00 per year more than paid last year to this account, which would give in addition to the present water facilities a plant for iron removal, water softening and filtration, a sewer system and sewerage disposal plant.

THIRD: This project does not mortgage or encumber the revenues of the electric light plant, does not increase the general bonded indebtedness of the City, nor can there be under the statute any recourse to taxes for the payment of the revenue bonds—nor can there be any special assessments against individual property for the payment of the bonds. They are payable solely from the revenues derived from the sale of water and sewerage service.

FOURTH: The above contemplates an outright gift from the Federal Government of $77,850.00.

FIFTH: The Sanitary Water Board of the State of Illinois has ordered the City to show cause why the Water Board should not issue an order to the City to discontinue pollution of Asa Creek. The Water Board can proceed as follows: First, hold a hearing this month and if the City cannot show that they have corrected the pollution or are taking steps to, the Board can issue an order giving a certain length of time to comply with the order. Second, failure to comply with such order would subject the City to $100.00 per day for every day they disregarded the order, or a penalty of $36,000.00 per year, and would not relieve the City of the necessity of complying with the order which would necessitate the building of the sewer and disposal plant. A judgment secured by the State on any sizable penalty might seriously hurt the City's credit and place in jeopardy, their property.

SIXTH: While the grant from the Federal Government can probably be secured now to help build the system it may not be available later, placing the entire burden on the City then.

Would you pay 15c per month more on your minimum bill to have water with the iron removed, softened and filtered? Yes ( ) No ( )

Would you pay a minimum charge of $1.75 per month to have 2500 gallons of SOFT water with the IRON REMOVED, and filtered and SEWERAGE Service and basement drainage? Yes ( ) No ( )

If not a water user would you pay a minimum charge of 75c per month for sewerage service and basement drainage? Yes ( ) No ( )

If you are a tenant would you pay the above charges if the landlord made the services available? Yes ( ) No ( )

If you are a landlord would you make the above services available to tenant if the connection charges were dropped and the tenant would pay the service charge? Yes ( ) No ( )

In ..... number of buildings.

Should the City go ahead with the sewers and and sewerage disposal plant, and the additions to the water plant, of iron removal, water softening and filtration? Yes ( ) No ( )

This is to certify that I have been interviewed by

.....

Date .....

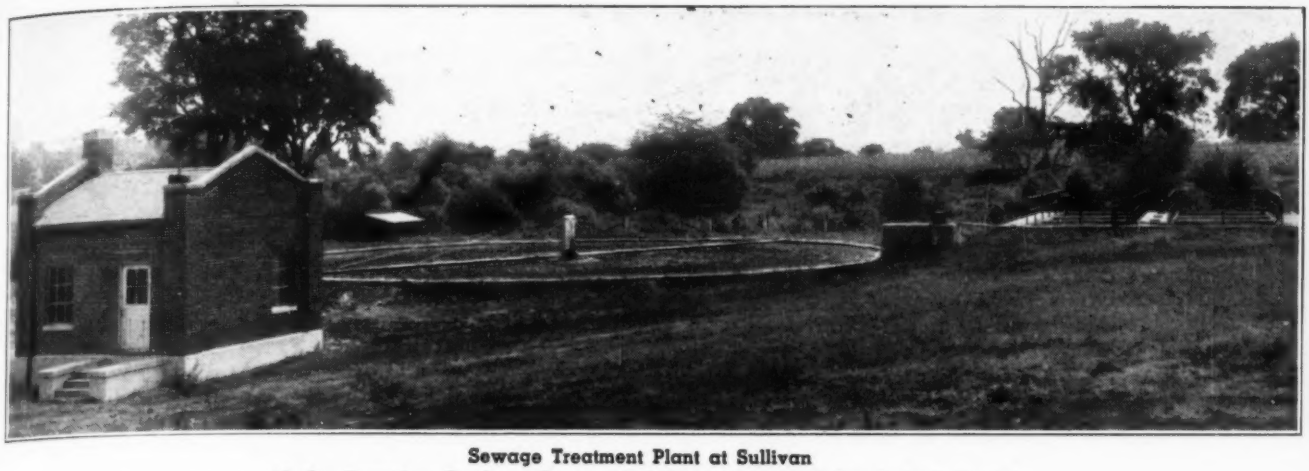
Signed .....

The preliminary drawings and the engineer's estimates are on file at the water company's office, and are open for inspection during the office hours.

Water and Sewage Survey Questionnaire—Sullivan, Ill.—1935

(A cut made from the original form supplied by the author.)

Thus 69.4 per cent of the voters interviewed were favorable to proceeding with the two projects. Out of 367 city water customers 357 were accounted for, showing the thoroughness of the survey. Table II presents data on the sanitary facilities in the houses in Sullivan. The ratio of houses per city water connection (2.1:1) and the ratio of inside to outside toilets (26:29) shows that the city was only approximately 50 per cent saturated with respect to city water connections, and modern sanitary plumbing. The ratio of cisterns to city water supplies (16:14) showed that a large majority of city water users retained and used cistern water because it is soft. The ratio of private wells to city water supplies (19:14) showed



Sewage Treatment Plant at Sullivan

(Left—Pumping Station; Center—Trickling Filter; Right—Imhoff Tank.)

that many houses used well water for drinking and washing purposes.

New Improvements

As a result of this survey, engineers were employed, financing arranged, and the improvements constructed in 1936. These improvements consisted of a complete water purification plant for softening, iron removal and filtration of the water supply, and a complete sanitary sewer system including a sewage pumping station and sewage treatment plant.

The water treatment plant made use of the old pumps for low service, and new pumps were installed for high service to the city distribution system. Water from the wells is pumped to an aerator for iron oxidation from which it flows by gravity to a mixing basin with 30 min. detention where lime is added for softening. A settling basin of 50,000 gal. equipped with continuous sludge removal equipment is followed by filters and chlorination and a clear well of 107,000 gal. capacity. The total capacity of the plant is 360,000 gpd. with a city pressure of 43 psi.

The sewage treatment plant consisted of a single unit Imhoff tank, designed for a 3 hr. detention based on a flow of 300,000 gpd. and a rotary distributor trickling filter followed by a secondary settling tank with a 90 min. detention period. The sewer system was designed as a separate sanitary sewer for a future connected population of 5,000. Minimum sewer size was 6 inches.

The two projects were completed for a cost of $178,000 and went into operation in October, 1936. At that time there were 390 water consumers and no houses connected to the sewer system.

Operation Results

The success of the operation of the water softening plant is evident from the data in Table III.

No trouble is experienced with after-precipitation, and corrosion of hot water tanks has been found only where the water is heated to a high degree.

The success of the operation of the sewage treatment plant is evident from the data in Table IV.

In 1944 there were still 40 septic tanks in use in the city and approximately 225 privies still being used, with some untreated sewage going to Asa Creek. By 1949 the number of privies in use had been reduced to 100, and only 20 septic tanks were still in operation. Very little untreated sewage now reaches Asa Creek.

Table IV

OPERATION OF SEWAGE TREATMENT WORKS

	Oct. 1936	1944	1949
Population of City	3,200	3,500	4,000
No. of Sewer Services	0*	384	711
Volume of sewage treated—gal. per day	0	90,000	180,000
Settleable Solids			
Raw Sewage—ml/L		18	18
Final Effluent—ml/L		0	0
Relative Stability of Effluent—days		10	2

*By May 1937 there were 93 sewer services connected to the sewer.

Table III

	1936	1944	1949
Population of City	3,200	3,500	4,000
No. of Water Services	390	662	964
Per cent Metered		98	98
No. of Industrial Consumers		15	16
Average Daily Pumpage—gal. per day		270,000	420,000
Hardness of Raw Water ppm.		391	365
Hardness of Treated Water ppm.		85	125
pH of Treated Water		8.8	9.3
Cost of softening per 1000 gal.		2.76¢	10.0¢

Table II

DATA ON SANITARY FACILITIES IN HOUSES

(530 Houses out of 588 Surveyed)

No. of houses interviewed	530
Rooms	3130
Bathrooms	253
Basements	248
Wet	74
Dry	174
Fixtures	
Basement drains	213
Bathtubs	236
Showers	32
Wash Basins	230
Toilets	234
Sinks	300
Water Supply	
City	242
Well	350
Cistern	297
Sanitation	
Cesspools	189
Sewers	45
Outhouses	259

Table I

SUMMARY OF SURVEY OF VOTERS' ATTITUDE TOWARD WATER AND SEWAGE WORKS IMPROVEMENTS

	City Supply	Private Well	Roomers	Not Interviewed	Total
Families Interviewed	237	253	52	46	594
Voters Interviewed	474	529	77	111	1191
Voters Favorable to Entire Project	373	359	53	.....	785
Voters willing to Pay Increased Costs:					
$0.15 more per mo. for soft water	373	244	....	.....	617
$1.95 per mo. for soft water and sewage treatment	335	232	....	.....	567

Joint Management

The success of these improvements is obvious not only by the growth of the two services but also in the financial returns to the projects. The management of the two services is lodged in one superintendent. Only one bill is mailed each month. A copy of the rate schedule appears below.

Rate Schedule

WATER AND SEWER COMBINATION RATE

			Per 1,000 Gallons
First	3000	gallons or less	76c
Next	5000	"	70c
"	5000	"	65c
"	5000	"	60c
"	10000	"	50c
"	10000	"	45c
"	10000	"	35c
"	10000	"	25c
"	30000	"	20c
"	12000	"	15c

Any customer using over 650,000 gallons per month and not more than 1,000,000 gallons per month..... 10c

Any customer using over 1,000,000 gallons per month and not more than 2,000,000 gallons per month..... 10c
(Minimum Bill.....$50 per month.)

Any customer using over 2,000,000 gallons per month..... 10c
(Minimum Bill....$150 per month.)

There will be a minimum charge for water and sewerage services for each connection of $1.90 per month. All of the foregoing charges are subject to a 10% discount for payment on or before the tenth of each month.

WATER RATE ONLY

			Per 1,000 Gallons
First	3000	gallons or less	65c
Next	5000	"	60c
"	5000	"	55c
"	5000	"	50c
"	10000	"	45c
"	10000	"	40c
"	10000	"	35c
"	10000	"	25c
"	30000	"	20c
"	12000	"	15c

Any customer using over 650,000 gallons per month and not more than 1,000,000 gal. per month..... 10c

Any customer using over 1,000,000 gallons per month and not more than 2,000,000 gallons per month..... 10c
(Minimum Bill.....$90 per month.)

Any customer using over 2,000,000 gallons per month..... 10c
(Minimum Bill....$160 per month.)

There will be a minimum charge for water service for each connection of $1.65 per month. All of the foregoing charges are subject to a 10% discount for payment on or before the tenth of each month.

Where sewerage service is used alone, the monthly rates will be as follows:

For domestic service 75c per month flat for each connection to the sewer.

For industrial and commercial service 50c per month flat for each fixture discharging waste into the sewer. A minimum charge of $1.00 per month flat shall be made for this class of service.

There are practically no delinquent payments of accounts. It is considered to be of economical and administrative advantage to collect the two bills as one.

Separate accounts are not kept for the two services, and no annual budgets are developed. The charges have been ample to cover the cost of operation of both services. In 1944, income was approximately $2,400 each month, of which $18,000.00 a year went into the sinking fund to pay bonded indebtedness. At that time it cost approximately $900 a month for bonds and interest. By 1944, therefore, a balance had been built up to $18,000.

Now in 1949 income is up to $3,200 per month. Operating costs and bonds and interest amount to $2,575 per month. The sinking fund balance has now reached $21,291.50.

This project to give Sullivan a good soft water supply and a sewage plant has been successful, economical and practical. Joint management has helped to keep operating costs down.

PENNA. HEALTH DEPT. HOLDS SESSION AT STATE COLLEGE

Just prior to the opening of the annual meeting of the Pennsylvania Water Works Operators' Assn. at State College, Penna., the Penna. Dept. of Health Bureau of Sanitary Engineering held a one-day session.

With the exception of three or four men absent on emergency work, all of the men in the Bureau attended the session. The accompanying photograph shows the group on the steps of Old Main at Pennsylvania State College.

The Bureau now numbers 160 persons including clerical and stenographic personnel. This is almost double the strength of the Bureau two years ago. Most of the increase has been brought about by the intensive clean streams program of the Commonwealth of Pennsylvania. At least sixteen of the men in the picture were 1949 graduate engineers.

Recognizable in the front row are H. E. (Ted) Moses, Cons. Chief Engr., J. Ray Hoffert, Chief Engr., and F. E. Daniels, Chief Chemist.

WATER CHEMISTS, INC., REORGANIZES

Announcement has been made of the change of the name of Ralph M. Westcott Co. to Water Chemists, Inc., 1700 South Main Street, Los Angeles 15, Calif. The president of the reorganized company is Robert H. Savage, who has been associated with the company since 1946. Mr. Westcott, who formerly headed the company, has left to open a consulting service with Dr. Richard D. Pomeroy.

Water Chemists, Inc., consists of nine men specializing in the servicing of the water side of water cooled refrigeration, boiler water conditioning, etc.

PENNA. WATER WORKS OPERATORS' ASSN. ANNUAL CONFERENCE

I. M. "Mike" Glace Resigns As Secretary

PROBABLY the most startling development at the 22nd Annual Conference of the Pennsylvania Water Works Operators' Association, held at Pennsylvania State College, August 22 to 24, was the resignation of I. M. Glace as Secretary. Mr. Glace had helped to organize the association and had been its secretary and driving force from its inception. At the time of his resignation the membership had risen almost to 500 persons.

President
Geo. W. Naylor
Mgr.
Vandergrift Wat. Co.
Apollo, Pa.

Past Pres.
C. P. Abraham
Supt.
Bur. of Water
Lancaster, Pa.

Officers of Pa. W. W. O. A.
1st Vice Pres.
P. P. Merkel
Cons. Chem.
Reading,
Pa.

2nd Vice Pres.
I. M. Glace
Cons. Engr.
Harrisburg,
Pa.

Secy.-Treas.
R. E. Stiemke
Prof. San. Engr.
Penna. State Coll.
State College, Pa.

The meeting, which was held as usual in the Electric Engineering Bldg., was attended by 318 registrants and about 60 ladies, by far the largest attendance which has ever been recorded at one of these meetings.

New Officers

The following officers were elected to serve the Association for the ensuing year:

President
George W. Naylor, Mgr.
Vandergrift Water Co.
Apollo, Pa.

1st Vice Pres.
Paul P. Merkel, Chemist
City of Reading
Reading, Pa.

2nd Vice Pres.
I. M. Glace, Cons. Engr.
Harrisburg, Pa.

Sec'y-Treas.
Robert E. Stiemke, Prof.
San. Engr. Dept.
State College, Pa.

Elementary Bacteriology

The technical sessions opened on Monday evening with an address of welcome by J. O. Keller, Assistant to the President, Pennsylvania State College. Following Mr. Keller's talk, there was a demonstration of the use of apparatus for bacteriological tests. The demonstration was titled **"Elementary Bacteriology"** and was presented by Martin E. Flentje, Research Engr., American Water Works Co., New York, N.Y.

Mr. Flentje defined bacteria and showed by means of pictures taken with an Electron microscope the various types of bacteria, including coccus, bacillus, streptococcus and virus. Also with audience participation he gave the pronunciation of various bacteriological terms.

Mr. Flentje pointed out that in water bacteriology there were four principles which are followed: (1) Pathogenic bacteria are not looked for, (2) bacteria that show sewage contamination are sought, (3) coliform bacteria are hardier than pathogenic bacteria, and (4) bacteriological tests are only a record; they are not a control test.

One of the features of the demonstration was a large size projection of a laboratory record sheet showing the six sections which generally make up such a record. Mr. Flentje explained each of these sections and gave the type of data which would be used to fill in each section. The six sections in the laboratory record include the historical section (date, place, etc.), count, presumptive coliform test, confirmed coliform test, completed tests, and opinions.

Mr. Flentje was assisted in the demonstration by George Untermark, Chemist, Berwick Water Co., Berwick, Pa.

Following the evening technical presentation, an open house was held at the University Club, with the compliments of the Association. The open house included a free lunch of ample proportion and all that goes with it.

Lancaster Filter Operation

"OPERATION OF THE LANCASTER PLANT," by L. S. Duckworth, Supt. of Filtration, and J. E. Goodell, Chemist, Municipal Water Works, Lancaster, Pa.

Mr. Duckworth reviewed the history of the Lancaster Water Supply, beginning with the choice of source back in 1819 and the development of the supply beginning in 1836. The modern plant dates from 1916 when electrified pumping equipment was installed. The slow sand filter plant had been installed in 1906 by a private company. In 1925 the filter plant was purchased by the city and in 1933 the present 16 mgd. filter plant was built.

The present plant site consists of 80 acres which are planted in red and Scotch pine and other trees, shrubs, and flowers. Water is pumped from an impounded reservoir on the Canastota river and is screened by a Link Belt screen to keep out leaves, stick, etc. Chemicals are applied in a rapid mix with vertical and horizontal baffles. There are three dry feed machines for filter alum, one for lime, one for activated carbon, and two for

ammonium sulfate, one of which is now used to add copper sulfate at the rate of 2 lb. per mil. gal.

One interesting item in the story of the Lancaster plant was the fact that the first Dorr clarifier installed in a water plant was placed in operation in Lancaster in 1927. It was found necessary to slow down the speed of the clarifier in order to prevent breaking up of the parts, and the clarifier was baffled to prevent short-circuiting. It is followed by a secondary settling basin, where ninety to 95 per cent of the suspended solids are removed.

The Lancaster plant now uses Anthrafilt in place of sand on two filters and finds it quite effective. All filter walls are painted with a water resistant Inertol paint. The walls are

Programmers

J. O. Keller
Asst. to Pres.
Penn. State Coll.
State Coll., Pa.

M. E. Flentje
Res. Engr.
Amer. W. W. Co.
New York City

scrubbed once a year and painted every three years.

Filter wash water amounts to less than 2 per cent of the total water pumped. Two filters are washed every fourth day. Last year four Palmer Filter Sweeps were installed and this year the other four filters will have similar installations. Twenty-five per cent less wash water has been used since the installation of these filter surface-washing devices.

Prechlorination is not used, but ammonia and post chlorination are the featured practice. The filtered water is aerated from June to November to reduce odor, but there is no loss of chlorine in this process since the ammonia-chlorine process is used.

The supply is from a flashy creek in which the turbidity may change as much as 1000 ppm. in an hour. There is usually sufficient alkalinity for alum coagulation, but after a rain lime may be added. Algae growths in the filters are held down by the addition of 25 grams of copper sulfate to each trough. Pumpage average is 9.3 mgd. with a peak load of 16 mgd. In 1948, 362 tons of alum, 8 tons of chlorine, 27 tons of activated carbon, and 9 tons of copper sulfate were used to remove 707 tons of solids from the raw water.

All of the 14,000 water services in the city are metered.

Penn. State Utility

"Operation of the Water System and Other Utilities of Pennsylvania State College" by R. W. Sigworth, Supt. of Utilities, Pennsylvania State College, State College, Pa.

Mr. Sigworth describes the utilities on the campus and stated that 191 buildings existed, not including several fraternities, on the campus. Of these, 104 are served by steam, and practically all by water. There are four departments in the physical plant of the University including the utility division which takes in air, gas, water, steam, telephone, electric power, and elevators.

Utility operation problems are mainly concerned with steam in the winter and water in the summer. The biggest water problem is to find a sufficient supply. The University has a 500,000 gallon water tank (a picture of which appeared on the front cover of the November, 1948, issue of *Water & Sewage Works*), the capacity of which is only sufficient for ½ day's consumption. Cathodic protection has been used in the tank for 10 years, the principal difficulties occurring during freezing weather. The tank has never been painted in 12 years and is cleaned but once a year.

There are four sources of water for the college campus, and Mr. Sigworth described the number of wells which have been put down in order to obtain this water. Water is exchanged with the borough at a cost for pumping. At times the college has an excess of water, and at other times the reverse is true.

Ninety-nine per cent of the consumption is metered, but it has been found that 19 per cent of the water pumped is not recorded as used. Whether or not this is all line loss is not known. Out of 148 meters, 9 account for 56 per cent of the total flow. Per capita consumption in the dormitory appears to be 55 gal. per day. The total count in the water supply is less than 10 per ml. Boiler water is taken from one particular source because it has only 20 ppm. of hardness. This is the surface supply from the mountains; all other supplies from the wells are too hard for boiler use.

Leak Detectors and Pipe Locators

"The Use of Leak Detectors and Pipe Locators", with exhibits of various apparatus, by V. B. Corle, Manager, Westmoreland Water Co., Greensburg, Pa.

Mr. Corle pointed out in his discussion that no water works superintendent should depend on the location of leaks by looking for them on the surface; one should look below the surface with modern leak locators. Good records of pipe locations are highly desirable, but where records are poor the use of locating devices is essential.

Among the types of equipment used, Mr. Corle showed the following: the dipping needle, the buzzer pipe energizer (which is satisfactory only where suitable connections can be made), and electronic devices. These electronic devices include the inductive type, the conductive type, and the radio balance type.

In addition Mr. Corle mentioned

Programmers

L. S. Duckworth
Supt. Filt.
Water Works
Lancaster, Pa.

R. Y. Sigworth
Supt. of Util.
Penn. State Coll.
State Coll., Pa.

the geophone which is a listening device somewhat similar to a doctor's stethoscope, but for this instrument one needs trustworthy operators, and it is best used at night when all is quiet. For locating leaks the meter reader can also use a flashlight which he can place against a fire hydrant or a meter and listen as he would with a telephone receiver.

One should always check fire hydrants first. Frozen soil, ice, and snow hamper the sound of the leak, particularly when one is using the geophone type of locator. Mr. Corle outlined the features of good electronic devices and showed the M-scope, the Goldak device, and others.

To illustrate how important leak location is, Mr. Corle mentioned several instances, one of which showed a night rate of 275,000 gal. per day. Following the use of leak locators, this was reduced to 43,000 gpd. and in 15 days to 18,000 gpd. In another instance, a 2-inch line was broken and running full, and in the third instance the 1-inch lead service was found to be abandoned and running full.

Mr. Corle stated that leak locators should be used regularly, but that they did not work too well on asbestos-

cement pipe. He stressed the need for accurate records for all non-metallic pipes. Cement pressure pipes which contain a metallic core can be located by electronic devices.

A field demonstration of the various types of locators and leak detectors was made by Mr. Corle in cooperation with Mr. R. Y. Sigworth of the College, and a number of leaks were found. These were exposed by crews for the audience to see.

Underground Arteries

A moving picture presentation was made by the Johns Manville Corp., the picture being titled "Underground Arteries" and showing the use of asbestos cement pipe ("Transite") for water distribution mains. The motion picture also showed how "Transite" pipe is made.

Program

V. B. Corle
Mgr.
Westmoreland Wtr. Co
Greensburg, Pa.

J. H. Adamson
Dist. Engr.
U. S. Geol. Surv.
Pittsburgh, Pa.

Geology

"How the Rocks of Pennsylvania Were Formed and Their Influence on the Quality of Public Supplies" by Jack B. Graham, District Geologist, U. S. Geological Survey, Philadelphia, Pa.

In the absence of Mr. Graham, his paper was presented by John H. Adamson, Geologist, U. S. Geological Survey, Pittsburgh, Pa. Mr. Adamson told of the origin of rocks in the earth and the origin of the earth itself; presenting the various hypotheses which have been proposed to explain the origin and formation of the earth.

It is now estimated from studies of the radioactive half life of uranium, that the earth is about two billion years old and that there was no life for the first 1½ billion years. Some 500,000,000 years ago cockroaches, scorpions, etc. appeared; 200,000,000 years ago the first vertebrae appeared. During the last 60,000,000 years specialized animals have developed, of which man developed only in the last 1,000,000 years. By means of pictures and diagrams, Mr. Adamson in presenting Mr. Graham's paper, explained the formation of rock and its effect on the quality of public water supplies. He showed how color, acid, alkalinity, iron, calcium, magnesium, chlorides, nitrates, sulfate, etc., in waters depended upon the geological formation with which the water came into contact.

Safety

"The Supervisor's Stake in Safety" by H. F. Webb, General Safety Director, Water Works Service Co., New York, N.Y.

Mr. Webb opened his presentation with the statement that there are many economies to be found in promoting safety. The burden of a safety program is on the supervisors, and such a program must start from the top level.

Mr. Webb said that the American Water Works Assn. has no statistics on safety records, but that the accident record is probably worse than one would expect. As an example, he told of the operator who used a dust respirator in place of a gas mask.

Management must recognize that workers are individuals. It must realize that safety is an important factor in operation and production. Safety is an investment which pays dividends in lower cost, better production, and heightened morale. Supervisors are responsible for production, and, therefore, must be responsible for safety.

According to Mr. Webb, insurance is not sufficient to prevent accidents. An accident is anything unexpected which affects production and this includes personal injuries. It is the supervisor's responsibility to stop and to prevent accidents.

Pointing out that an accident is a production error, Mr. Webb said that accidents may be avoided only by doing the work in the right way, which is the safe way, and the efficient way. If improper methods are allowed to continue, an accident will be bound to occur. Accident prevention, production and efficiency go hand in hand.

Whether or not an accident occurs, an improper action is a waste of time, brings lower efficiency and interferes with production. The answer is to get people to do the jobs in the way they should be done. This means proper supervision.

Mr. Webb stated that one should never compromise between safety and production. To lick the problem of human misbehavior, one must concentrate on what he is doing. Workers should not be allowed to become automatons.

In listing the injuries which have occurred in the American Water Works Co., Mr. Webb said that 66 per cent of the accidents fall into four categories. These include handling materials which produce back strain, etc., handling tools which account for one in every four accidents, flying objects, and falls. Falls are the most prolific source of accident. Hand tool accidents come from using the wrong tools, defective tools, incorrectly using the tool, or not putting it away.

The other 34 per cent of accidents include such things as electrical accidents, animals, poison, gases, slides, etc.

CLEANING AND LINING MAINS

A symposium on cleaning and lining of water mains was presented with four speakers taking part. The subjects covered were "The Necessity, Cleaning Methods, Lining Methods, and Operation Aspects."

Program

J. A. Frank
V. P. & Gen. Mgr.
Nat. Wtr. Main. Clean.
New York City

A. B. Anderson
Chief Engr.
Pitt. Pipe Clean.
Pittsburgh, Pa.

Necessity for Cleaning and Lining

"The Necessity" by R. F. Goodhue, Chief Engineer, Middle Dept. Rating Association, Phila., Pa.

In the absence of Mr. Goodhue, his paper was read by Professor R. R. Kountz, Assoc. Prof. of San. Engr., Pennsylvania State College, State College, Pa.

The paper pointed out that fire protection capacity is that residual capacity after the consumers' demands have been met. A series of data on several Pennsylvania municipalities showed that the "C" value of these supply lines was from 42 to 62, whereas the "C" value of new lines is 120. Mr. Goodhue's paper pointed out that when water mains are new there's plenty of fire protection, but after additional consumers are added then loss of capacity develops; and the supply for fire purposes is meager indeed. Most water supplies are undersized for complete fire protection. Cleaning may not be sufficient in corrosive water. Relining may or may not be necessary or economic. These were the principal points presented by Mr. Goodhue's paper.

Cleaning Methods

"CLEANING METHODS" by J. A. Frank, Vice Pres. and Genl. Mgr., National Water Main Cleaning, New York, N.Y., with demonstration by means of a Lucite model.

Mr. Frank explained the operation of pipe cleaning processes. He pointed out that the first step is to determine the length of pipe to be cleaned, the probable quantity of dirt to be removed, the pressure available, the blowoff available, and the number of consumers affected by shutting off the pipe. The next step is the excavation which is made before the line is cut off. The third step in the cleaning process is to notify the customer, determine the best time to shut off, and check all valves for operation. Door to door notification is used, and door knob notices are left where personal contacts are not made. The next step is the cutting of the pipe and making the entrance and exit for the pipe cleaning machine.

Also Programmers

R. R. Kountz
Assoc. Prof.
Penn. State Coll.
State Coll., Pa.

R. J. Schweitzer
Dist. Engr.
Amer. W. W. Co.
New York City

In larger sizes, longer runs may be made, up to 17 to 20 miles of pipe having been cleaned in a single run. For the larger pipes the cleaner is propelled by water pressure; in the smaller pipes the cleaner is motor-operated by a drag line.

Mr. Frank concluded his topic with a discussion of the economics of pipe cleaning.

Lining Methods

"LINING METHODS" by A. B. Anderson, Chief Engineer, Pittsburgh Pipe Cleaning Co., Pittsburgh, Pa.

Mr. Anderson pointed out that results of cleaning often were not permanent and rehabilitation of the lining was often required. There are two kinds of lining, these depending on the size of pipe. For 24 inches and greater (a pipe which will admit a man) either type of lining is used; for less than 24 inches the problem is different. In the case of cement lining it is necessary to clean and dry the pipe. The pipe must be open and cement mortar added and trowelled in place. Mr. Anderson described the three types of machines available for this type of work.

For pipe under 24 inches both cement and electrolytic lining with bituminous material may be used. Cement lining is done in pipes up to 20 inches; bituminous lining by electrolytic methods has no pipe size limitation.

Mr. Anderson described how the bituminous compound known as Lectumin is added to the pipe and how the device is drawn through the pipe "plating out" the bituminous compound on the surface of the pipe. It is not necessary to shut off service and the pipe can be lined at a rate of 1000 feet in 8 to 12 hours. This type of lining has been successfully used in a number of instances.

Operating Aspects of Pipe Lining

"OPERATING ASPECTS" by R. J. Sweitzer, Distribution Engr., American Water Works Co., New York, N.Y.

Mr. Sweitzer called attention to the fact that there are two types of mains to be cleaned or lined.

These are transmission lines and distribution lines. Before attempting the cleaning or lining of either type, it is necessary for the engineer to determine whether or not cleaning will lower the pumping cost enough to pay for the job. Also it is necessary to know whether sufficient storage is available in order to allow the pipe line to be taken out of service. Pumping gradient improvement is a factor to be considered and one should always determine how long it will take for the cost to be paid off. The conditions vary and time is only one factor. Main cleaning is not a panacea, according to Mr. Sweitzer.

Mr. Sweitzer said that in many instances it has been found that the actual cost of cleaning and lining the main was as much as three times the original contract price. He also noted that in some cases cement lined pipes have a low "C" value, and that this is often caused by the presence of manganese dioxide in the water. He pointed out that some of the reasons for not cement lining in place included high cost, the need for cleaning plugs, the long outage of the line, etc.

In summary he pointed out that while cleaning is generally good, it is necessary to evaluate the data before the final decision is made. Experience with a water determines the life of a pipe, and should be taken into consideration. The presence of manganese dioxide may cause trouble, and this too should be considered. The lining in place of a pipe should certainly be compared to the cost of new pipe if it is necessary to greatly improve the carrying capacity of the transmission or distribution main.

Feature Golf Match

R. B. Mowry of W&T and Alan A. Wood of Philadelphia played "grudge" match for "charity." Mowry won 5 up.

RURAL NOTE ON NEW USE FOR CHLORINE

Nelson M. Fuller, Supt. of Water, Batavia, N.Y., reports a new use for chlorine as a treatment for taste and odor removal. This is his story.

On the farm of the family of J. R. Shepard, of Putnam Settlement outside of Batavia, a fox terrier named "Jinx" chased a skunk. In an effort to evade the dog, the polecat ran under the back porch and found himself in the family well, where he came to his end during the night.

Next morning when Mr. Shepard drew a glass of water he found it highly flavored with essence of butyl mercaptan, and he promptly called on Mr. Fuller to help him out of the problem of removing "that awful taste."

With a can of high test hypochlorite in his hand, Mr. Fuller strode to the rescue of the Shepard's. A good dose of H.T.H. and what do you know, no more skunk water.—A new use for chlorine in the removal of tastes and odors.

DIFFUSER PLATES CLEANED BY OXY-ACETYLENE FLAMES

And Metal Surfaces Prepared for Painting by "Flame-Priming"

SURFACE clogging of diffuser plates used in activated sludge plants has always been a problem since usual cleaning methods are time-consuming and costly. Acid washing requires removing the plates. When sandblasting is used, additional time is needed to clean up the sand debris.

Recently, the flame-cleaning process for plate cleaning was tried at N.Y. City plants when the plates became clogged. Trial tests proved that the high temperature Oxy-acetylene flame-cleaning head did an excellent job of spalling off the clogged surfaces. Equal layers of clogged surface material were spalled off until air passage through the plates was normal again.

Fig. 1 shows the flame-cleaning operation. An "Oxweld" oxy-acetylene blowpipe with a 12-in. flame-cleaning head was mounted on an "Oxweld" machine. The quick high heat of the oxy-acetylene flames popped thin layers of clogged surface material loose as the "flame-brush" passed across the plates at a regulated rate of travel for best results.

Three men did the flame-cleaning. One man ran the machine, a second man handled the hose from the oxygen and acetylene cylinders, and the third man swept up the spalled-off material. The three-man crew cleaned the plates in one unit in six hours. The same crew usually takes about a week to do the same job by sandblasting.

Flame-Priming

Flame-cleaning is also used extensively for preparing steel surfaces on all types of structural steelwork, storage tanks, dams, locks and piling for painting. The process is economical and easy to use, and the warm, dry, treated surfaces are ideal for the application of paint.

When the flame-cleaning process is used to prepare surfaces for painting, it is referred to as "flame-priming," The word "priming" seems better for conveying the idea that this process primes the surface for the first coat of paint.

In flame-priming, loose scale is popped off and rust is dehydrated and loosened. The warm, dry surface is then easily cleaned to receive the paint coat. As soon as the metal is heated by the special heating head, the surface of the steel is wire-brushed and swept to remove all loose material. Paint is applied as soon as the steel has been swept. (See Fig. 2.) The temperature of the steel is still above that of the surrounding air, so no moisture can form on the cleaned surfaces. The warm steel gives a low-temperature bake to the paint, thus increasing the durability of the paint film. As a further advantage, painting can be done under cold and damp conditions which would otherwise cause major delays. Interior of pressure filters and the like have been very successfully prepared for painting by flame-priming.

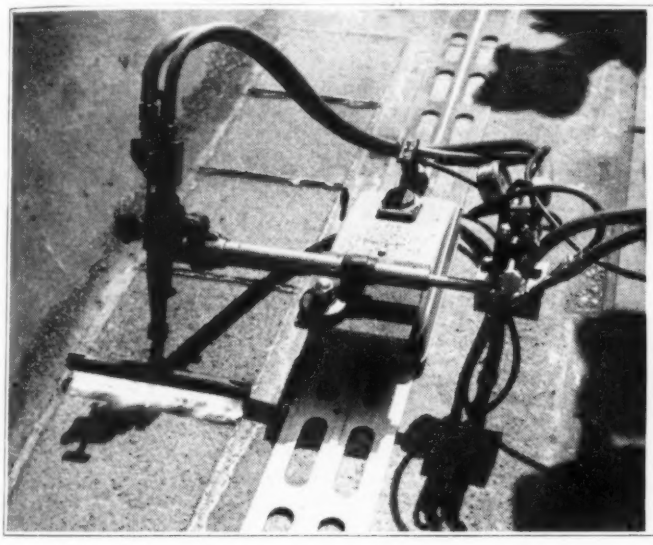


Fig. 1—Flame-Cleaning Diffuser Plates
(About 1/16 in. of clogged surface material is spalled off on each pass of the machine and flame-cleaning head.)

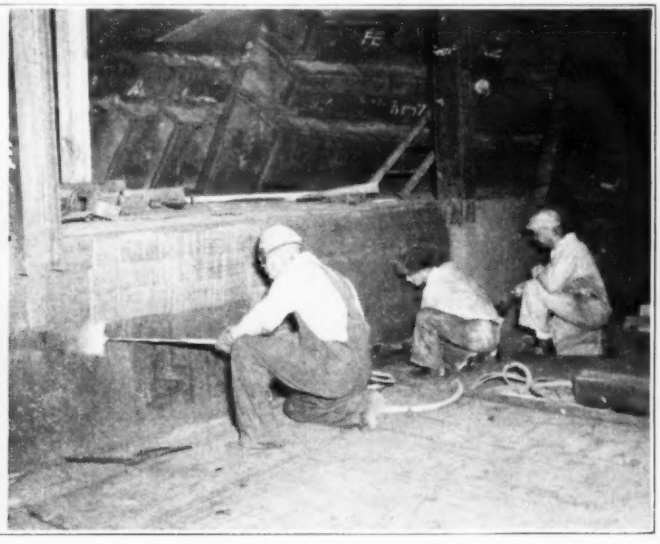


Fig. 2—A "Flame-Priming" Job
(One man is flame-cleaning the steel; the next is brushing off the loosened scale; the third is painting the warm, dry surface.)

Flame-Cleaning Equipment

The high-velocity, high-temperature flames required in flame-cleaning are produced by multi-flame in-line heating heads, ranging in widths from 1 to 12 inches. They are easily attached to standard welding glowpipes, either directly or by means of an extension. The entire unit is light, well balanced, and easy to handle.

The ready portability of the equipment makes the process ideal for use in the field as well as in the shop. In the field, oxygen and acetylene is usually supplied from manifolded cylinders.

Acknowledgement — Photographs with this article were supplied by The Linde Air Products Co.

The Editor's Comments

To the Southwest Section— Hats Off!

Taking a look back at the record of places where the Southwest Section of A.W.W.A. has held its conventions in years past, Oklahoma City is conspicuous for the number of times it appears as the Convention City.

Judging from the noteworthy convention facilities and arrangements, and the overall quality of the recent convention of the Southwest Section during the week of October 10th, there appears to be "a reason" for the popularity of Oklahoma City as a convention place. In support of this opinion the writer has since read that Oklahoma City has taken a top position as one of the Nation's favored convention cities.

What are some of these convention facilities provided by Oklahoma City? Well, perhaps the top ranking facility is Oklahoma City's very adequate and attractive Municipal Auditorium, centrally located within easy walking distance of the largest and best of Oklahoma City's hotels. On the lower floor of the Auditorium is an exhibit hall not surpassed by any in the country, according to this writer's belief. Meeting rooms are adequate and comfortable.

In connection with the Southwest Section Convention the Manufacturer's Exhibit Committee, under chairmanship of W. E. "Bill" Pebworth (Hersey Meters), together with F. V. "Vic" Sole (R. D. Wood) and "Tom" Hanlon, Jr. (U. S. Pipe), put on a Manufacturer's Exhibit of dimensions and attractiveness not exceeded by any except that of A.W.W.A.'s Annual Convention. And, if measured by attractiveness of arrangement and layout rather than size, not even the exhibits of the parent association have surpassed those of the Southwest Section in Oklahoma City.

As to convention arrangements and entertainment, there have never been any to this observer's thinking which have surpassed those at Oklahoma City. Credit for this goes to Oklahoma City's Sup't. of Water and Sewage Works, Morrison B. Cunningham, National Director of A.W.W.A. and chairman of the S.W. Section's Convention Management Committee. But it was just like "Cunnie" to claim that he could take only a small share of credit for the smooth running of this convention which clicked from start to finish, and to give major credit to his local committee, consisting of "Bob" Hardcastle, Eric Sherman, "Ernie" Schouten, and Frank Taylor, the latter having also served as chairman (protem) of the Technical Program Committee during the illness of Chairman "Ed" Stapley (Okla. A.&M.) now back in harness again, and better than ever we were pleased to note.

Further, in regard to convention arrangements, Chairman Cunningham gave justified praise to the work of the members of his water and sewage works staff, which provided arrangement and transportation facilities so that convention attendants could visit any or all of the facilities and operations of the Oklahoma City Water and Sewage Works at their convenience. High credit for the well organized transportation and inspection arrangements and information service goes to "Cunnie's" Engr. of Supply, Karl Bean, who was later elected to the S.W. Section's Board of Trustees.

With the registration total reaching 618, the Oklahoma City Convention set an all time high record for attendance. In addition, the S.W. Section exhibiting with justified pride the Hill Cup, awarded that Section recording the greatest membership increase for the year (based on a weighted per cent gain), could also boast a recent membership increase which puts the S.W. Section (now 672 members) next to the California Section in size, having forced its rival N.Y. Section out of second position into third.

Credit for the outstanding progress made by the S.W. Section during the past five years or so belongs principally to Leslie A. Jackson, Secretary of the Section and Manager of Little Rock's Water Dept. No one at the Oklahoma City Convention could have worked harder or longer hours than did Secretary Jackson who, in person, registered every one of the 618 registrants in addition to his many other duties. Likewise, no one has worked harder or longer during the year between conventions in building up membership and strength in the Section, and A.W.W.A. recognizes this service more perhaps than Secretary Jackson realizes.

We regret very much our inability to get the report covering the Southwest's 38th Annual Convention ready in time to meet the dead line for this issue. In recognition of the marked strides being made by the S.W. Section we take pleasure in dedicating this page to such prowess, and to those responsible therefor. It was fitting that in attendance at the Oklahoma City Convention this year was the immediate past-president, the president and the vice-president of the parent Association. Hats off to the Southwesterners!

L. H. Enslow

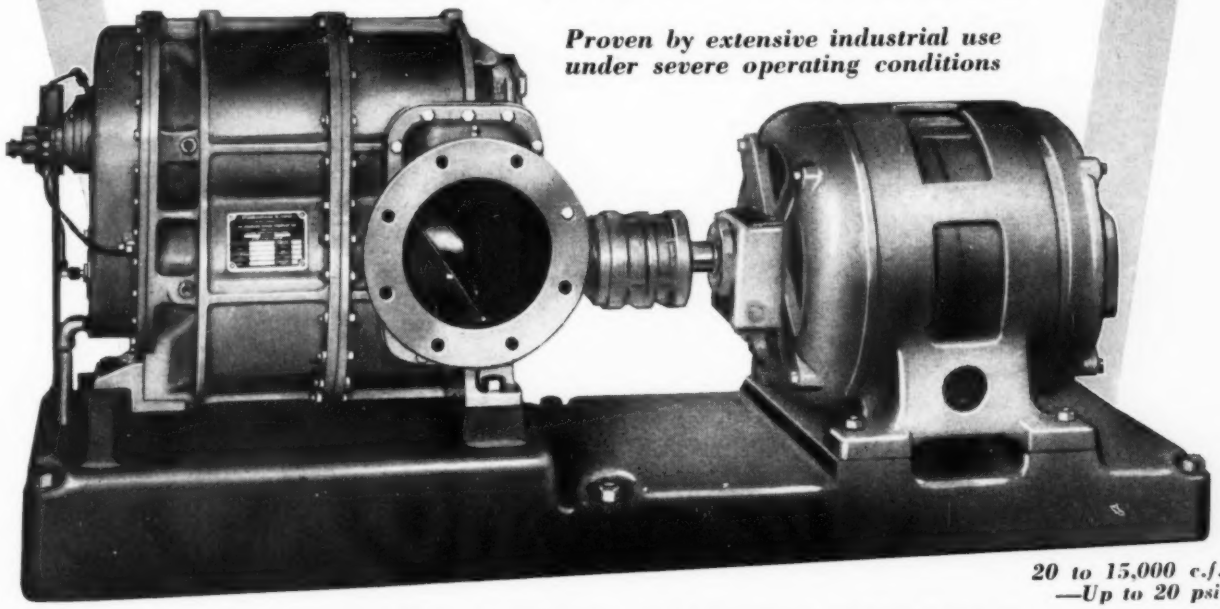
ANOTHER STEP FORWARD

THE "Chicago"

STANDARDAIRE BLOWER

EFFICIENT • QUIET • COMPACT

Proven by extensive industrial use under severe operating conditions



20 to 15,000 c.f.m. —Up to 20 psi.

6 FEATURES NEVER BEFORE AVAILABLE IN POSITIVE DISPLACEMENT BLOWERS

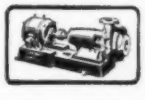
1. **QUIET OPERATION**
   No clatter or pounding. Sound level comparable to centrifugal blower.
2. **LASTING EFFICIENCY**
   Greater adiabatic efficiency allows lower applied horse power for most ratings. Maintains original efficiency as verified by continuous quiet operation.
3. **CUTS COST OF INSTALLATION**
   Quiet operation permits elimination of blower room in many instances.
4. **COMPACT**
   Requires less layout area than conventional blowers of equal capacity.
5. **SIMPLIFIED MAINTENANCE**
   Non-wearing oil seals do not require maintenance or replacement. No wear on moving parts with clean air.
6. **DESIGNED FOR LONG LIFE**
   Precision materials and select materials insure long life under continuous operation.

INQUIRIES REGARDING
The CHICAGO
STANDARDAIRE BLOWER
should be directed to The Chicago Pump Company, Exclusive Sales Representatives in the Sanitary Engineering Field.
Manufactured by
The Standard Stoker Company, Inc.

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2300 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**



Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs Water Seal Pumping Units. Samplers.

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

STATEMENT OF OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946.

Of *Water and Sewage Works*, published monthly at Mount Morris (Ogle County), Illinois, for October 1, 1949.

State of Illinois } ss.
County of Cook }

Before me, Clare Mehl, in and for the State and county aforesaid, personally appeared Edward S. Gillette, who, having been duly sworn according to law, deposes and says that he is the publisher of the *Water and Sewage Works*, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily, weekly, semiweekly or triweekly newspaper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Edward S. Gillette, 22 W. Maple St., Chicago 10, Ill.

Editor, L. H. Enslow, 155 East 44th St., New York 17, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Gillette Publishing Co., 22 W. Maple St., Chicago 10, Ill.

L. H. Enslow, 155 East 44th St., New York 17, N. Y.

H. P. Gillette, 22 West Maple St., Chicago 10, Ill.

Winifred Gillette, 1125 Oak Grove Ave., San Marino, Calif.

Louise E. Forsythe, 410 Thayer Road, Swarthmore, Pa.

Mrs. R. W. Hume, 303 South Stone Ave., La Grange, Ill.

Provident Trust Co., 17th and Chestnut Sts., Philadelphia, Pa.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is: (This information is required from daily, weekly, semiweekly, and triweekly newspapers only.)

EDWARD S. GILLETTE,
Publisher.

Sworn to and subscrized before me this 27th day of September, 1949.

CLARE MEHL,
(Seal) Notary Public.

(My commission expires Dec. 19, 1952.)

MEETINGS SCHEDULED

Nov. 2-4—WASHINGTON, D.C. (Wardman Park Hotel)
Chesapeake Section A.W.W.A. (1st Annual Convention) Sec'y-Treas., C. J. Lauter, 5902 Dalecarlia Place, Washington, D.C.

Nov. 3-4—DAYTON, OHIO (Dayton Hotel)
Ohio Section A.W.W.A. Sec'y, F. P. Fischer, 812 Perry Payne Bldg., Cleveland 13, Ohio.

Nov. 7-9—SOUTHERN PINES, N.C. (Highland Pines Inn)
North Carolina Section A.W.W.A.
North Carolina Sewage Works Assn. Sec'y, E. C. Hubbard, State Board of Health, Raleigh, N. C.

Nov. 11-13—YUMA, ARIZ. (San Carlos Hotel)
Arizona Section A.W.W.A.
Arizona Sewage Works Assn. Sec'y, Helen Rotthaus, State Department of Health, Phoenix, Ariz.

Nov. 14-16—ORLANDO, FLA. (Orange Court Hotel)
Florida Section A.W.W.A. Sec'y, A. E. Williamson, Jr., P.O. Box 1431, Daytona Beach, Fla.

Nov. 17—BOSTON, MASS. (Hotel Statler)
New England Water Works Assn. Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston 8, Mass. (Next meeting Dec. 15th.)

Nov. 17-19—ATLANTIC CITY, N.J. (Hotel Madison)
New Jersey Section A.W.W.A. Sec'y, C. B. Tygert, Box 178, Newark, N.J.

Nov. 18-19—GAINESVILLE, FLA. (Hotels Thomas & White House)
Public Health Engineering Conference. Director, Professor John Kiker, Dept. Civil Engineering, University of Florida, Gainesville, Fla.

Nov. 29-30—W. LAFAYETTE, IND. (Purdue University-Union Club)
Fifth Industrial Waste Conference. Chairman, Professor Don E. Bloodgood, Purdue University, W. Lafayette, Ind.

DEC. 5-7—ALBANY, GA. (Gordon Hotel)
Southeastern Section A.W.W.A. Sec'y, T. A. Kolb, Room 433 Wade Hampton Office Bldg., Columbia, S.C.

DEC. 14—AUGUSTA, ME.
Maine Water Utilities Assn. Sec'y, Earle A. Tarr, Winthrop, Me.

DEC. 15—BOSTON, MASS. (Statler Hotel)
New England Water Works Association. Sec'y, Joseph C. Knox, 204 Tremont Building, Boston 8, Mass.

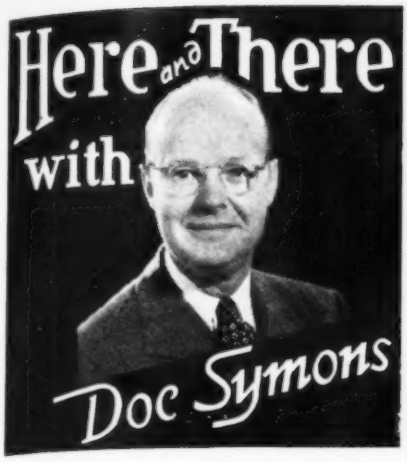
JAN. 17, 1950—NEW YORK, N.Y. (Statler Hotel)
New York Section A.W.W.A. (Winter Luncheon Meeting). Sec'y, Rollo K. Blanchard, 50 West 50th St., New York 20, N.Y.

JAN. 17-19—NEW YORK, N.Y. (Commodore Hotel)
American Society of Civil Engineers. Sec'y, Wm. N. Carey, 33 West 39th St., New York, N.Y.
(Sanitary Engineering Division, Thursday, Jan. 19 A.M. and P.M.)

JAN. 20-21—NEW YORK, N.Y. (Statler Hotel)
New York State Sewage Works Association. Sec'y, R. C. Sweeney, District Engineer, State Dept. of Health, 119 E. Main St., Rochester, N.Y.

FEB. 8—PORTLAND, ME.
Maine Water Utilities Association. Sec'y, Earle A. Tarr, Supt. Winthrop, Me.

MAY 21-26—PHILADELPHIA, PA. (Reservation announcement Dec. 1)
American Water Works Association (Annual Convention). Executive-Secretary, Harry E. Jordan, 500 Fifth Ave., New York 18, N.Y.



H.T.M.A.—And before I forget it again this month, I want to give credit where credit is due. Do you remember the photograph which appeared in the August column?—Snapshots taken at and after the Hayseed Hullabaloo of the A.W.W.A. Convention in Chicago last June—They were taken by Tom Driskell, the Ohio (Morton) Salt man of Wadsworth, Ohio.

* * *

From the pleasures of that convention, my memory skips to the following week when I flew down to Tuscaloosa, Ala., for the Water and Sewage Works Conference at the University of Alabama.

It was there that Alex (Ala. Polytechnic) Taylor, "Charlie" (Health Dept.) White, Joe (Health Dept.) Crockett, and others introduced me to the wonders of corn—Corn bread, corn pone, and corn "squeezins."

Seems as though every sanitary engineer I met down there had gone to Harvard, from Art (Chief Engr.) Beck on down. Great bunch of boys in Alabama and a wonderful audience to work for.

* * *

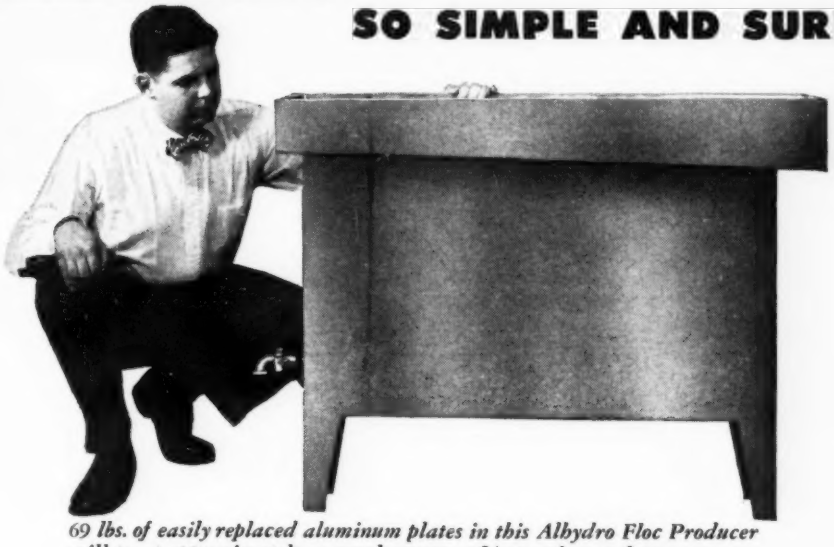
Speaking of audiences that have given me a great lift, right now I want to thank the Iowa Sewage Works Assn. for their wonderful response to my routine, when I pinch hit for "Pete" (F.S.W.A.) Wisely at the annual dinner in Des Moines in September.

I sat next to Nan and "Bob" Schwob (of the Carl Schwob sanitary engineering dynasty). "Bob" is now on Paul Houser's staff of the Sanitary Engineering Div. in Iowa, and Nan, besides being a mother, was doing nurse's duty with polio cases at the time. Incidentally, I can highly recommend her to any other after dinner speaker who needs a good straight man.

For Industrial And Municipal Water Treatment Plants

Alhydro FLOC PRODUCER

NO OTHER METHOD OF FLOC PRODUCTION SO SIMPLE AND SURE



69 lbs. of easily replaced aluminum plates in this Alhydro Floc Producer will treat approximately as much water as ¾ ton of coagulants . . .

Since the Alhydro unit employs the principle of low voltage d.c., electrolytic dissolution of aluminum plates in water to produce aluminum hydroxide floc, it completely eliminates the conventional problems of shipping, handling and storing bulky chemicals. Moreover, there is seldom any need for chemical feeders—production of Alhydro floc is controlled with a simple turn of a dial.

Tests conducted under wide variation of conditions have proved that the Alhydro Floc Producer assures efficient coagulation over a wide range of water temperatures, clarity and pH, and in most instances completely eliminates the necessity for corrective chemicals.

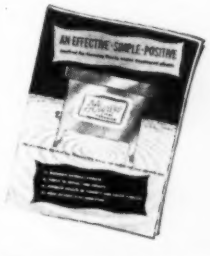
One Alhydro unit treats approximately 300,000 gals. per day . . . multiple unit installations are used for larger requirements.

"We are enlarging our present plant and will include 8 Alhydro units instead of the 5 we now have. Here are a few reasons:

1. Less storage space required for chemicals
2. Cost is practically the same as chemical coagulants
3. Minimum of attention by only one operator. To increase the floc volume, the operator simply increases the amperage by turning a dial
4. Floc forms rapidly and does not change pH of water so we are able to produce a stabilized water with this method."

Clifford Fore, District Manager

Read what the Illinois Cities Water Co. of Mt. Vernon, Illinois says:



GET THE FULL DETAILS

Read this folder which illustrates and describes the features and advantages of the Alhydro Floc Producer in treating drinking water or water for industrial use. Write for your free copy today.

ALHYDRO, INC. DEPARTMENT 11B 516 N. CHARLES ST., BALTIMORE 1, MD.

How Do You Pronounce it?—Yep, it's the same word about which I have written on several previous occasions. This time it was a clipping service bureau which confused sewers of the needle and thread variety with sewers of the sewage variety.

Although the article was headed "Success of Seam-Ripping Needle Amazes Grandmother-Inventor," the word "sewers" appeared seven lines down, and to the clipping service that was all that was necessary to cut it out and mail it to us.

Over in Newark, N.J., is a fellow named W. F. Schaphorst, a mechanical engineer, who keeps this magazine well supplied with kinks, gadgets and nomographs for solving all kinds of problems. Mr. Schaphorst also sends along other interesting items. Not long ago he sent us this item of a "progressive supply company, which in 1925 explained the reason for a slow remittance with these words:"

"We have been held up, held down, sandbagged, walked on, flattened out and squeezed; first by the United States Government for Federal War Tax, the Excess Profits Tax, Liberty Bonds, Thrift Stamps, Capital Stock Tax, Merchants' License, Auto Tax, and by every society and organization the mind of man invents to extract what we may or may not possess from the Society of St. John the Baptist to the G.A.R., the Woman's Relief, the Navy League, the Red Cross, the Blue Cross, the Double Cross, the Children's Home, the Dorcas Society, the Y.M.C.A., the Y.W.C.A., the Boy Scouts, and every hospital and church in town.

"The government has governed our business until we don't know who owns it. We are inspected, suspected, examined, and re-examined; informed, misinformed, required, and commanded until we don't know who we are, where we are, or why we are. All we know is that we are supposed to be an inexhaustible supply of money for every known need, desire or hope of the human race. And because we will not sell all we have and go out and beg, borrow, or steal money to give away we have been cussed, discussed, boycotted, talked to, talked about, lied to, lied about, held up, robbed, and nearly ruined. The only reason we are clinging to life is to see what in Hell is coming next."

Mr. Schaphorst adds, "All those who would not be pleased to have those good old days of 1925 back, please raise your hands. Had the recipient of the above letter but known what was in store for us, he could have truly replied, 'You ain't seen nothin yet.'"

* * *

Things I should have done before—I'd like to have you readers meet the new advertising representatives of this magazine. Speaking geographically, there is Evans Kall in the New England area, Fred Michel in New York State, "Jim" Crippen in New Jersey, Pennsylvania and the southeast, and "Mel" Nylund in the mid-west. Lee McMahon still covers the Cleveland-Pittsburgh territory.

When you see any of these fellows around the conventions, walk up and say, "I've got a good story for Doc." They'll be glad to give it to me.

* * *

As I write this, just two weeks before the Federation meeting in Boston, I can't help but think back to the meeting last year in Detroit. It was there at the Board of Directors meeting that Secy. W. H. (Pete) Wisely was describing the functions scheduled for the ladies and explaining that admission would be by ticket only. Pete wound up with this, "Be sure your lady has a strip ticket."—What a comedian!

* * *

Now that I see where L. M. (Larry) Fisher is retiring from the U.S.P.H.S. to become Engineering Field Assoc. of the A.P.H.A., I'm reminded that A. V. (Cap) DeLaporte of "Bert" Berry's staff in To-

100-WHAMS-PER MINUTE

RIGHT ON THE JOINT

X 15 HOURS=90,000 KNOCK-OUT BLOWS

Line jointed with Tegul-MINERALEAD. 90 lbs. water pressure maintained. 50 lb. power hammer, engine-actuated, rigged to pound joint for 15 hours straight. Test ended with nary a sign of a leak. Nice going — eh? Do you wonder we call

Tegul-MINERALEAD

The SUPERIOR Jointing Compound for Bell & Spigot Pipe

THE ATLAS MINERAL PRODUCTS COMPANY

MERTZTOWN, PENNA. HOUSTON, TEXAS

removed under pressure

This pipe section was cut, under pressure, from a 48" main without shut-down or other interruption to service. The operation was performed in the course of inserting a gate valve in a 48" cast iron main, in the distribution system of the Water Bureau, City of Philadelphia, Pa.

Gate valves can be inserted under *pressure* by SMITH in cast iron, asbestos–cement or steel water mains, sizes 4" and larger, without shutting off service or dewatering the line.

30

GATE VALVES
CHECK VALVES
FIRE HYDRANTS
INSERTING VALVES
TAPPING SLEEVES AND VALVES
WATER SERVICE BRASS GOODS

THE A. P. SMITH MFG. CO.
ESTABLISHED 1896
EAST ORANGE, NEW JERSEY

FLOOR STANDS
INDICATOR POSTS
TAPPING MACHINES
INSERTING MACHINES
PIPE CUTTING MACHINES
CORPORATION TAPPING MACHINES

ronto wanted me to find out if "Larry's" secretary ever determined where to file a certain telegram of several months back. (Aside to reader—I don't know what the gag is either!)

* * *

And I wonder if that paragon of the sanitary engineering profession, John E. (Mich. Ch. Engr.) Hepler, ever found out the meaning of "preterlabent."

Add knowledge gained in travelling—That Les (U. S. Pipe—Chicago office) Hart was once an All America football player at Colgate. —And that the smoke stack of the Milwaukee Sewage Treatment Works was six inches out of line when it was finished.

* * *

At the annual meeting of the N.E.W.W.A., held this year at the beautiful Balsams in Dixville Notch, N.H., there was one event which was not on the program. As the result of an early morning and unscheduled plunge off a loose diving board into the lake, the "Certificate for the High Diving Championship of Lake Gloriette" was presented to one John Kennedy, Supt. Water Works, Winthrop, Mass. Witness Tom Craven ran for the nurse, who put Kennedy to bed for the remaining of the day.

* * *

Just to show you that editors can have fun at a convention, I show you here one well known editor (and wife) in the act of passing a "poison wand" to Ken (W&T) Van Brundt and partner during one of the "Elsa Maxwell Party" stunts up at The Balsams.

And to prove that associate editors can also have fun, here's V.T.Y. (and wife) almost getting rid of the same wand to the winning couple consisting of Mrs. Roger (Danvers, Mass.) Esty and Edgar Buttenheim, well known publisher of another magazine. (The man whose back you see is Bela Bizony, violinist extraordinary.)

* * *

The old order changeth—"Bob" Stiemke, Prof. of San. Engr. at Penn State, took on the job of filling I. M. (Mike) Glace's shoes when the latter resigned, at the August meeting, as Secretary of the Penna. Water Works Operators' Assn. Organizer and first and only secretary as well as guiding hand for 23 years, Mike retired to devote more time to beating Harry Krum (Allentown's Chief Water Fixer) at Golf.

* * *

Incidentally, the best golf match at the Pa.W.W.O.A. meeting was the "benefit" match played between "Bob" (W & T) Mowry and Alan

FERRIC CHLORIDE SOLUTION

LOOK TO DOW AS YOUR SOURCE OF SUPPLY

A SUPERIOR COAGULANT FOR:
- *SLUDGE CONDITIONING*
- *SEWAGE COAGULATION*
- *WATER PURIFICATION*

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN
New York • Boston • Philadelphia • Washington
Cleveland • Detroit • Chicago • St. Louis
Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

DOW
CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

Wood, manufacturers' agent, of Philadelphia. The beneficiary was the association treasury (for prizes) to the extent of $52. Encouraged by a gallery which caddied, coached, and generally added to the merriment, including exploding golf balls and balls with off center weights to make them roll away from the cup, the match wound up with Mowry winning 5 and 4 while the scores were about 122 to 126.

* * *

I got in some golf, too—my annual stint—and believe it or not, after my drive on the 17th hole, Earl (W&T—Pittsburgh) Johnson stepped up and shook my hands—Praise from the Master, than which there is no whicher on the golf links.

Every time I play golf out there, and I don't play any place else, I think of Marge Coltart (Mrs. Rodney of the Philadelphia Link Belt's) who told me once that when she built a house, she was going to build it right in the middle of a golf course. When asked why, she replied, "Because, it's never too hot—, it's never too cold—, it's never too windy—, it's never too wet—, it's never too dry—, the weather is always perfect—on a golf course."

O.K.! So you've heard that story before—So have I, but I just wanted to hear it again.

* * *

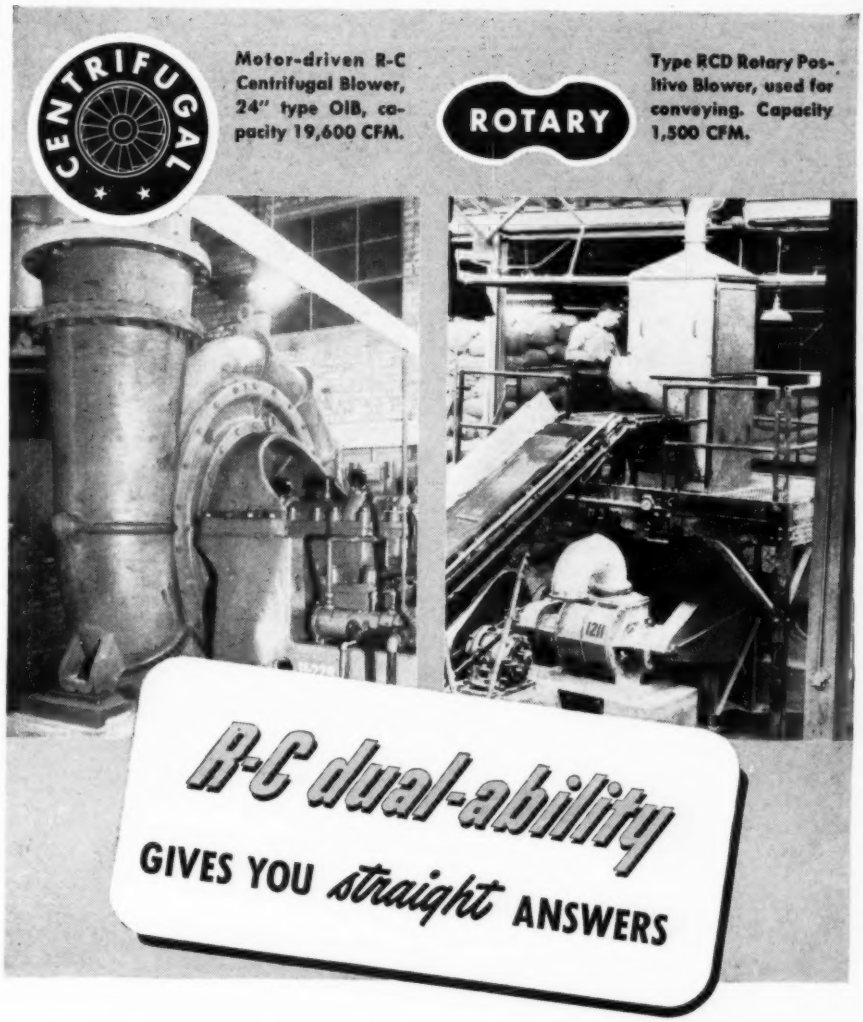
What's in a name?—Any time you get out to Don Bloodgood's Industrial Waste Conference at Purdue, you're apt to run across a couple of fellows named H. D. **Lyon** and C. B. **Lamb** of Carbide and Carbon.—Not the *Ides* of but the *Ends* of March—Ouch!

* * *

Two or three times in the course of the past several years I've received letters from readers commenting on my "Walter Winchell" type of reporting. But you can look through all 74 columns to date and you'll find that I've never mentioned a "blessed event" or "infanticipating," and I'm not going to start now, even though I know that we are going to miss seeing Norma (Mrs. Harry of PFT) Schlenz at the Federation meeting in Boston.

* * *

Oh, yes, at The Balsams I ran into two of my favorite people, Jacques and Jacquelin Benoit. Jacques, formerly of the W & T Montreal office, is now associated with H. W. Lea as a consulting engineer, an announcement which I failed to get into the news columns of this magazine when it was news a short time back.


CENTRIFUGAL
Motor-driven R-C Centrifugal Blower, 24" type OIB, capacity 19,600 CFM.
ROTARY
Type RCD Rotary Positive Blower, used for conveying. Capacity 1,500 CFM.
R-C dual-ability
GIVES YOU straight ANSWERS

Centrifugal or Rotary Positive? Which type of air or gas handling equipment is best suited to your needs? The answer depends upon the specific job—and you'll get the cold, unbiased facts from R-C *dual-ability*.

We can give you this *dual choice* because we build both—and we are the only blower manufacturers who do so. Further, our range of sizes, capacities, pressures and other characteristics is so wide that we can usually match or very closely approximate even exacting specifications.

By such fitting of equipment to the requirements of the job, you get superior performance, dependability and long life from your R-C units—the natural result of 95 years of blower-building experience.

ROOTS-CONNERSVILLE BLOWER CORPORATION
911 Mount Avenue, Connersville, Indiana

ROOTS-CONNERSVILLE

BLOWER BUILDERS R-C SINCE 1854

BLOWERS • EXHAUSTERS • BOOSTERS • LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

* * ONE OF THE DRESSER INDUSTRIES * *

Do you remember the story of how, at the Poland Spring Convention of N.E.W.W.A. three years ago, Rollie (Omega Machine) Leveque locked his wife Nellie in their room while he went out to play golf on their 22nd wedding anniversary.—Well, this year being their 25th anniv. and they celebrating it at the Balsams meeting of N.E.W.W.A., I presented Rollie with a silver plated key—at his request, Nellie.

* * *

Have to rush this off to the printer —So—

V.T.Y.—Doc.

THE SPILLWAY

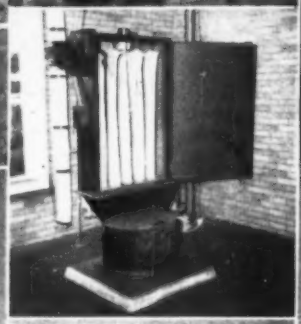
[Overflow from the main section]

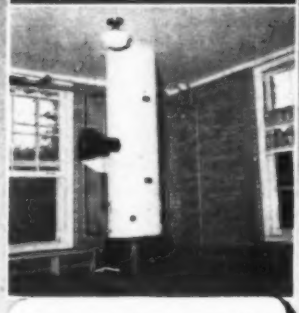
Stankewich Made Chief Sanitary Engineer Erie County, N.Y.

Announcement has been made of the appointment of Michael J. Stankewich as Chief of Bureau of Water and Sewage Control Engineering of the Erie County, N.Y., Health Dept., which includes the City of Buffalo. Mr. Stankewich will handle the supervision of public water supplies, sewage disposal, control of industrial wastes, stream pollution, swimming pools and bathing beaches. He was formerly a sanitary engineer with the New York State Dept. of Health, and during the war was a Sanitary Officer in the Army.

LANCASTER, PA.
Municipal Filter Plant

CHARLES P. ABRAHAM
Superintendent of Bureau of Water





The 100,000 to 110,000 people of Lancaster can be justifiably proud of this attractive water works. No effort has been spared in landscaping and decorating to make this plant a real beauty spot. To increase the palatability of its finished product, an Omega Universal Feeder with Dust Collector now feeds activated carbon into the filtered water. This Omega Feeder contributes to plant efficiency and plant housekeeping as well by providing dependable chemical feeding free from dust. For Bulletins describing Omega Equipment, address Omega Machine Company (Division of Builders Iron Foundry), Providence 1, R. I.

Omega Equipment furnished for Lancaster Municipal Filter Plant:

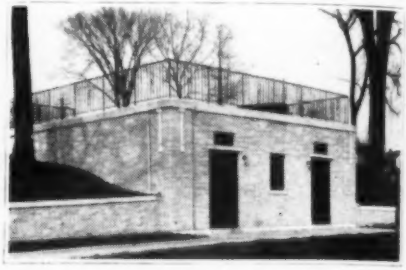
Universal Feeder, with mixing chamber and extension hopper. Dust Dust Collector.

Flow metering and controlling equipment at this plant is by Builders-Providence, Inc.

THE LAST WORD IN FEEDERS
OMEGA

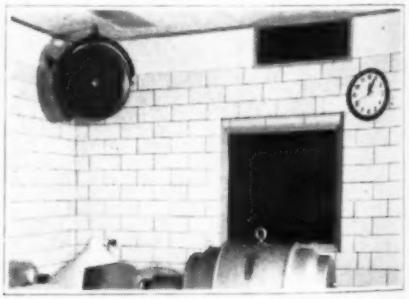
Suspension Heaters Used at Madison, Wisc.

Leon A. Smith, Supt. of Water, Madison, Wis., has found an easy way to heat outlying pumping stations. Shown in the accompanying photograph is a picture of the Well House for Unit Well No. 8. This is



Well House, Madison, Wis.

a modern, unattended, automatic pumping station supplying chlorinated well water to consumers in the northeast part of the city. It operates at a normal load of 2 mgd. over a period of 16 to 18 hours a day, but is designed to handle 3.4 mgd.



Unit Heater in Upper Corner of Booster Pump Room

In the winter time when the pumps are operating, there is sufficient heat generated to keep the building above 40 deg. F., but during the shut-down period, the temperature will drop well below freezing. To offset this temperature drop and maintain the building at 40 to 50 deg. F. during the shut down period (generally between 10 p.m. and 6 a.m.), Mr. Smith has installed four G.E. suspension style unit heaters. A 3 kw. unit heats the repair

shop, a 5-kw. unit the chlorinating room, a 7.5-kw. unit the turbine pump room, and a 12.5-kw. unit in the room housing the booster pump motor, switchgear, and unit substation.

"Since the pumping station was built in a public park adjacent to a residential section," according to Mr. Smith, "the conventional type of heating plant with smoke stack could not be adopted." The suspension heater was the answer.

During one three-month winter period when the plant was not in operation, the unit heaters were in constant operation 24 hours daily, seven days a week. Average cost of operation was approximately $9 a day for the full 28-kw. heating load (772 kwh. per day at $0.012 per kwh.)

MANUFACTURERS' and EQUIPMENT NEWS

1100

Water Proofing Concrete

Haynes Products Co., Omaha 3, Nebraska, has developed Formula No. 640, a clear liquid for water proofing and preserving stone, cast stone, concrete, cement mortar, lime or cement stucco, tile, brick, plaster, wood, wall boards, etc.

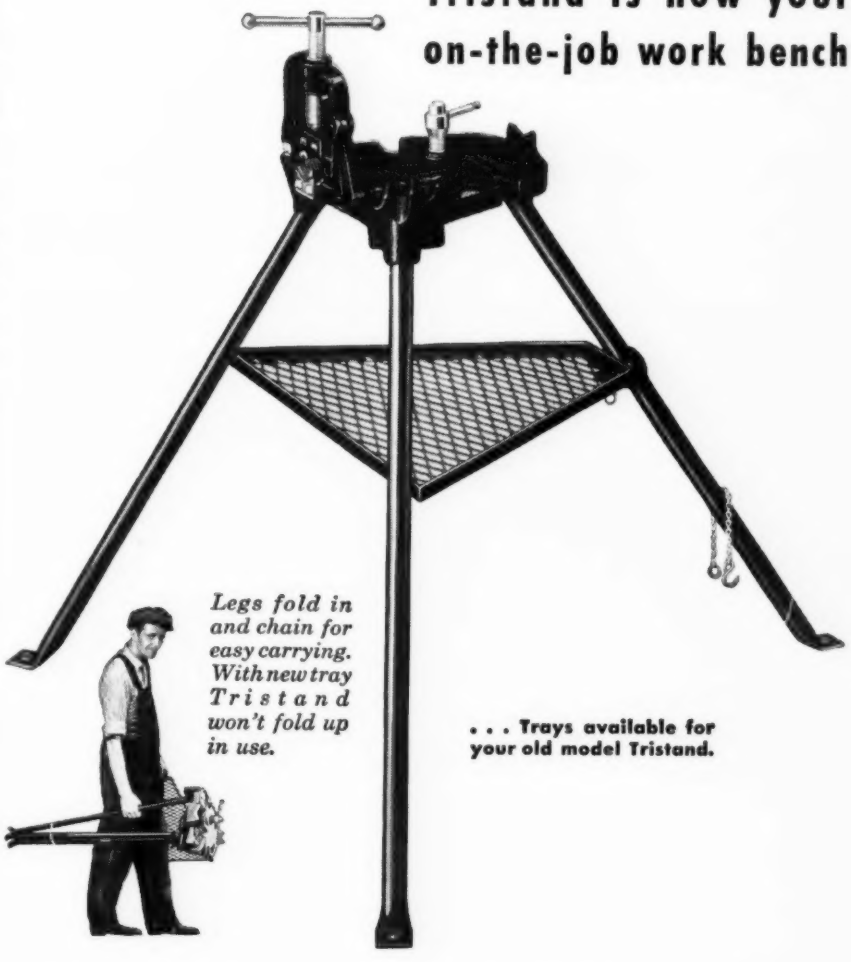
Formula No. 640 is a transparent liquid made up of seven different waxes and resins and a hydrocarbon base. It has great penetration ability, being drawn into capillaries of concrete surfaces, etc. When dried and hard it effectively seals masonry against water seepage from either side, and is applied with a brush or spray in less time than it takes for normal painting.

According to tests and experience, Formula No. 640 stops transmission of water, protects surface from acids and alkali, prevents paint from curling and peeling, prevents efflorescence and prevents metal laths from rust. It will waterproof a wall from the inside, will hold basements and sumps against hydrostatic pressure, and may be used to prevent dusting of concrete floors.

(Cont. on next page)

NEW TRISTAND VISE has Handy Tool Tray

RIDGID's New Tristand is now your on-the-job work bench



Legs fold in and chain for easy carrying. With new tray Tristand won't fold up in use.

. . . Trays available for your old model Tristand.

● All your tools are ready at hand, with this new RIDGID work-saver pipe vise. Tool tray keeps them in easy reach—eliminates stooping, speeds up work. New Tristand is easy to set up and take down, tray attaches in a jiffy. Legs have rubber feet to prevent "creeping." RIDGID's LonGrip tool-steel jaws have bulldog grip but are easy on polished pipe and tubing. Yoke vise, 2½" capacity; chain vise, 4." Buy the new work-saver RIDGID Tristand from your Supply House.

RIDGID

WORK-SAVER PIPE TOOLS

THE RIDGE TOOL CO. • ELYRIA, OHIO

For further information on this concrete wall and block coating, use a Reader Service Card on which is entered the above key number and your name and address.

W. H. Sheffield Jr. President Innis-Spieden

W. H. Sheffield, Jr., has been elected president of Innis-Spieden & Co., New York City, to fill the post left vacant by the death of his father in July. Mr. Sheffield had been vice president of the organization.

Hooker Promotes Coleman

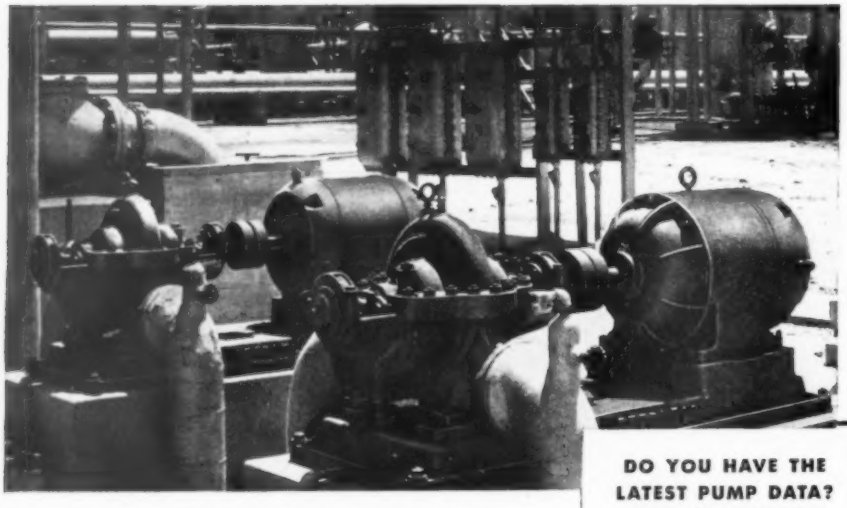
David M. Coleman has recently been promoted to the Sales Development Dept. of the Hooker Electrochemical Co., Niagara Falls, N.Y. J. S. Coey, Mgr. of Sales Development, announced that Mr. Coleman will handle the technical correspondence for all Hooker chemicals.

A graduate chemist of Worcester Polytechnic Institute, with two years of Navy service in the Pacific area, Mr. Coleman came directly to the Hooker Co. in 1943 to work in fine chemicals production. He has been more recently associated with the Process Study Group.

G. F. Twist Peerless Pump Mgr.

Announcement has been made by the Food Machinery and Chemical Corp. of the appointment of Gerald F. Twist as manager of the firm's Peerless Pump Division, with headquarters in Los Angeles.

WHERE THERE'S A PUMP IN YOUR PLANS



Plan with Peerless Centrifugal Pumps

All along your flow lines, Peerless can provide pumps incorporating the latest principles of hydraulic practice and experience plus the versatility and efficiency you require for *peerless* pumping performance.

For example, the pumps shown above are single stage, double suction, general purpose Type A pumps, a comprehensive line of Peerless pumps offering a capacity range from 50 to 60,000 gpm. There are scores of other Peerless types, hundreds of other Peerless models for thousands of pumping applications. Peerless furnishes horizontals for handling solids in suspension as well as for clear liquids. There are pumps for boosting, circulating, transferring and filtering. They can handle volatile L-P Gases or tricky acid, basic and salt solutions. They can move liquids at high temperatures or they can provide water (or foam) for *Underwriters' approved* fire protection. Duty can be intermittent or continuous; both single and multi-stage units, with the type of drive you desire, are available, meeting widest head and capacity conditions. Pump and driver are engineered as a unit, tested in a modern hydraulic laboratory that duplicates actual field conditions, to match or exceed purchasers' expectations.

Peerless field and sales engineers are located in all principal cities. For pump engineering information or service, call on them, or if you prefer, write for the latest pump engineering data. The chart at the right lists a number of the types of Peerless horizontal pump bulletins in which you will be interested.

DO YOU HAVE THE LATEST PUMP DATA?

Informative Engineering Bulletins Available From Peerless Pumps

Here are a few of the services Peerless Pumps perform. Request data by Bulletin number.

Pump Service	*Bull. No.*
Water Supply	B-1300
Fire Protection	B-1500
Chemicals and Oils	B-810
Vaporous Liquids	B-2201
Butane-Propane	B-2200
Boiler Feed	B-806
Sewage and Solids	B-154
Hi-Pressure	B-310
Acids and Caustics	D-2400
Process Services	B-803
All-purpose Pumps	B-2301

Peerless
VERTICAL AND HORIZONTAL
Pumps

fmc PEERLESS PUMPS

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Los Angeles, California — Indianapolis, Indiana
District Offices: New York 5, 37 Wall St.; Chicago 40, 4554 N. Broadway; St. Louis 8, 3908 Olive St.; Atlanta Office: Rutland Bldg., Decatur, Ga.; Omaha, Nebr., 4330 Leavenworth St.; Dallas 1, Tex., 3905 Elm St.; Fresno, Calif.; Los Angeles 31, Calif.

1101

Rubber Pinch Valve

Ray Wilcox, 1436 Land Title Bldg., Philadelphia 10, Penna., has announced the Wilcox Rubber Pinch Valve for use in the handling of corrosive liquids, semi-solids and granular dry materials. Non-corrosive and non-clogging, the valve has application in the handling of industrial wastes, and sewage sludges as well as chemicals in water and sewage plants.

The valve is composed of three essential parts: Rubber tube, pinching mechanism, and housing. Besides many mechanical advantages, the valve provides excellent control of flow, assures leak-proof shut-off and gives long life under severe conditions.

For further information on this new valve, use a Reader Service Card on which is entered the above key number and your name and address.

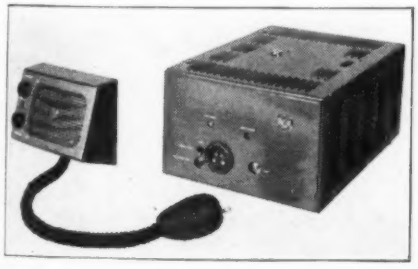
Paddock Engr. Sends Water Purifying Unit to Equador

Following the severe earthquake in Ecuador, the Paddock Engineering Co. of Dallas, Tex., donated one of its Tri-Sure Water Purifying Units to the area near Ambato, where in a city of 50,000, complete water supply facilities were destroyed. The Tri-Sure unit is a portable unit which can be installed on any stream or pond. The installation was flown to Ecuador and installed by Tom Collins, Dallas representative of the company, who was personally thanked by Ecuadorian President Galo Plaza Lasso, as shown in the accompanying photograph.

1102

Mobile Communications

Radio Corporation of America, RCA Division, Camden, N.J., has announced the new mobile communications equipment for the 30-50 MC



band. This item is known as the Fleetfone, a highly selective, two-way mobile communication system. The new equipment is designed for such important services as police, fire protection, forestry, public utilities, water supply, transportation, etc.

To obtain further information on this new equipment, use a Reader Service Card on which is entered the above key number and your name and address.

● If you could visit the Buffalo Meter factory you would see how Frost Bottoms are pre-tested for correct breaking pressure. The 400 pound compressed air test shown above guards against defects.

AMERICAN BRONZE CASE
NIAGARA GALV. IRON CASE
WATER METERS

BUFFALO METER COMPANY

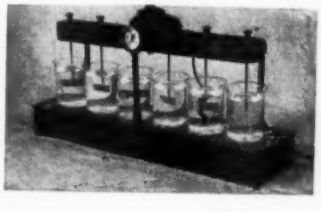
2909 MAIN STREET, BUFFALO 14, N. Y.

DARLEY MAGNETIC DIPPING NEEDLE $17.50

with 3 section telescoping handle $22.25

Write Today for 68-Page Catalog

W. S. DARLEY & CO., Chicago 12



Phipps & Bird

LABORATORY MIXER

● IS the important piece of equipment in the Modern Water Works Laboratory. Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.

PHIPPS & BIRD, INC. Richmond, Va.

1103

Sewer Cleaner

Champion Corp., Hammond, Ind., makers of the O.K. Champion Power Sewer Cleaner, have announced the development of a machine for use in extremely cold climates. The feature which makes the standard sewer cleaner useful even in winter is the installation of a Wisconsin Air Cooled motor as the source of power. With this motor, no difficulty is experienced in winter sewer cleaning operations.

The sewer cleaning machine proper is the same one which has been in successful use in many cities for many years. This includes the Kuhlman patented expansion bucket, with automatic safety clutch on the cable pull, an automatic level wind and secondary "free-wheeling" clutch on the cable drum, and a powerful band brake.

Other features on the regular machine include knee action wheels, secondary cable drum for light cable, automatic device to prevent backlash on cable drum, and the O.K. Champion manhole guide wheel jacks. Six sizes of buckets are available. This type of power sewer cleaner has the advantage that it takes the dirt out of sewers and up to the street where it can be hauled away.

To obtain further information about this sewer cleaner either with the standard water-cooled, or the air-cooled engine, use a Reader Service Card on which is entered the above key number and your name and address.

1104

Motors For Deep Well Pumps

Westinghouse Electric Corp., Box 868, Pittsburgh 30, Pa., has announced its new "Life-Line" motors

for deep well turbine pumps. These are weather proof, vertical hollow-shaft motors of the squirrel cage induction type, providing smooth operating characteristics, low maintenance and ease of installation.

For further information on this new motor, use a Reader Service Card on which is entered the above key number and your name and address.

Link-Belt Opens Duluth Office

Link-Belt Co. has announced the opening of a district sales office in Duluth, Minn., at 301 West First St. The new office will be under district manager John E. Morrison, assisted by Harold A. Ivarson.

A FREE COPY will gladly be mailed to anyone concerned with water conditioning and waste treatment problems. Here's an interesting 8½ by 11 inch bulletin containing 28 pages of factual information about the ACCELATOR . . the modern, proven, high-rate water treating plant. It's filled from full color cover to cover with installation pictures, charts, graphs and tables. The text, although scientific, is written in terms any layman can readily understand. Among the subjects covered are: 1. Historical development, 2. Accelator Apparatus, 3. The Process, 4. Distinguishing Characteristics, 5. Advantages, 6. Design, 7. Operation, 8. Applications, 9. Specifications, 10. Bibliography. Be familiar with the ACCELATOR . . the outstanding development of the 20th Century in the field of water conditioning. Send for your copy today. Use company letterhead or fill in and mail the convenient coupon below!

Gentlemen: Please send me your new 28 page ACCELATOR Bulletin #1825.

Company_____

Address_____

Individual_____ Title_____

INFILCO

• BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1894 •

INFILCO INC.

GENERAL OFFICES: 325 WEST 25th PLACE • CHICAGO 16, ILLINOIS

SALES OFFICES IN TWENTY SIX PRINCIPAL CITIES

WORLD'S LEADING MANUFACTURERS OF WATER CONDITIONING AND WASTE TREATING EQUIPMENT

READER SERVICE CARDS for

WATER & SEWAGE WORKS

Equipment — Products
Information — Literature

JUST
CLIP
THESE
CARDS
MARK
AND
MAIL —
TO
RECEIVE
THE
LATEST
INFORMATION
OR
LITERATURE
DESCRIBED
IN
THIS
ISSUE

Place Stamp Here

WATER & SEWAGE WORKS
155 East 44th Street
New York 17, N. Y.

Place Stamp Here

WATER & SEWAGE WORKS
155 East 44th Street
New York 17, N. Y.

Write key number of item you desire here →

Your name .....

Title .....

Company or Dept. .....

Address .....

.....

WATER & SEWAGE WORKS READER SERVICE

Write key number of item you desire here →

Your name .....

Title .....

Company or Dept. .....

Address .....

.....

WATER & SEWAGE WORKS READER SERVICE

Write key number of item you desire here →

Your name .....

Title .....

Company or Dept. .....

Address .....

.....

WATER & SEWAGE WORKS READER SERVICE

Write key number of item you desire here →

Your name .....

Title .....

Company or Dept. .....

Address .....

.....

WATER & SEWAGE WORKS READER SERVICE

Write key number of item you desire here →

Your name .....

Title .....

Company or Dept. .....

Address .....

.....

WATER & SEWAGE WORKS READER SERVICE

Write key number of item you desire here →

Your name .....

Title .....

Company or Dept. .....

Address .....

.....

WATER & SEWAGE WORKS READER SERVICE

READER SERVICE CARDS HOW TO USE THEM

Please fill out a separate coupon for each item on which you desire information. This will greatly facilitate handling.

Key number is at head of each new product, item of equipment, catalog or bulletin, described in this issue.

Enter key number in box.

Please PRINT your name and title, company or department name, and your address

NOTE—

These cards are to be used only for items described in THIS ISSUE

WATER & SEWAGE WORKS

Will see that you receive information desired.

Josam Forms Canadian Subsidiary

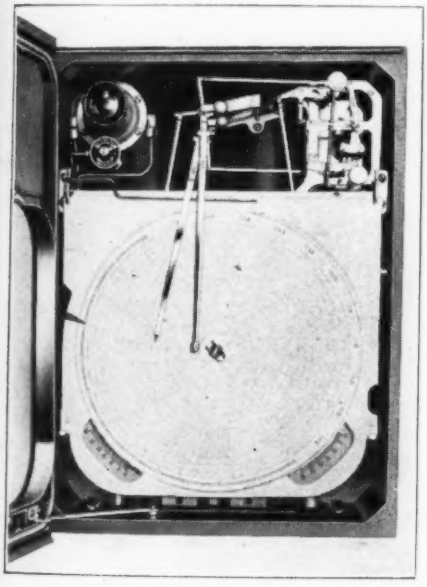
H. F. Paget

Josam Manufacturing Co., Cleveland, Ohio, and Michigan City, Ind., manufacturers of plumbing and drainage products, has announced the formation of Josam-Canada, Ltd. The new factory will be located at 20 Temperance St., Toronto 1, Ont., with Howard F. Paget as General Manager.

1105

Air-Operated Control Instruments

The Bristol Co., Waterbury, Conn., has announced a new line of air-operated control instruments known as the Series 500 Controllers.



Included in this line are controllers for automatically controlling temperature, pressure, flow, liquid level, humidity, and pH value. The new instruments are offered in five types of control action: on-off, proportional, reset, derivative, and reset plus derivative, and the instruments are readily convertible from one type to another.

To obtain further information about these new instruments, use a Reader Service Card on which is entered the above key number and your name and address.

WARREN
Solves Your
PIPE
PROBLEMS
BELL & SPIGOT PIPE •
FLANGE PIPE •
MECHANICAL JOINT PIPE •
FLEXIBLE JOINT PIPE •
SPECIAL CASTINGS •
SHORT BODY BELL & SPIGOT SPECIALS •
Warren Cast Iron Pipe and Fittings can be supplied in all sizes 2" to 84" with all types of joints and in accordance with Standard Specifications. Specify "Warren Pipe" for your next job.
Take advantage of our large stock of non-standard patterns, when in need of special castings to meet your individual requirements.
Warren
FOUNDRY & PIPE CORP.
55 LIBERTY ST. — N. Y. C.
WARREN PIPE CO. of MASS.
INC.
75 FEDERAL ST., Boston, Mass.

BOND-O

A safe self-caulking, self-sealing compound for jointing water mains. Used with complete confidence. Machine-blended for absolute uniformity. All BOND-O contains a germicide to inhibit oxidation by sulfur bacteria.

Northrop & Company, Inc.
SPRING VALLEY, N. Y.

Every Bond-o Joint is a Good Joint

STOP
JOINT LEAKAGE
USE
CARSON CLAMPS
With Pearlitic C.I. Bolts for Cast Iron Pipe and Fittings.
Write for Prices.
Carson-Cadillac Co.
1221 PINSON ST. BIRMINGHAM, ALA.

1106

Protective Corrosion Resisting Coating

Carboline Co., 7603 Forsythe Blvd., St. Louis 5, Mo., has announced the development of a new type of resinous coating for protection against corrosion. The resin is developed to have advantages over the polyvinyl chloride and chlorinated rubber coatings, particularly in its resistance to low pH at higher temperatures, high liquid temperatures, and solvents.

The new material is now known as B Resin Solution. A limited quantity is available at no charge for experimental and test purposes to plants interested in its application to their problems.

If you are interested in this new resin coating, use a Reader Service Card on which is entered the above key number and your name and address.

L. B. Keen Represents Sika in New England

Announcement has been made of the appointment of L. B. Keen as manufacturers' agent for the Sika Chemical Co., in Rhode Island and Connecticut.

M. A. Kise Res. Dir. Virginia Smelting

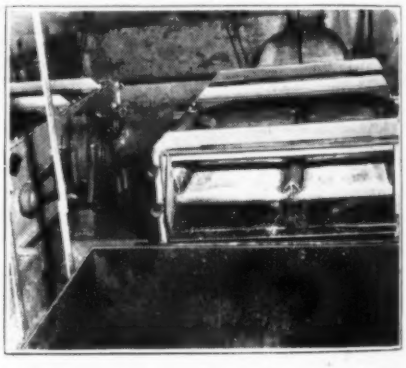
Dr. Mearl A. Kise has been named Director of Research and Development of the Virginia Smelting Co., West Norfolk, Va.

A graduate of Lehigh University, Dr. Kise was formerly assistant chief of Research for the Solvay Process Div. of the Allied Chemical and Dye Corp., with whom he had been associated since 1935.

1107

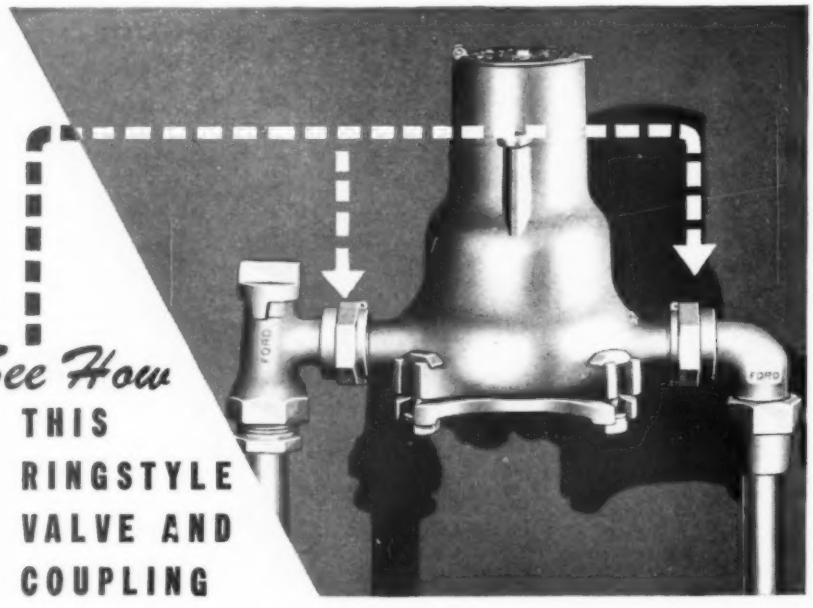
Vibrating Screens

Productive Equipment Corp., 2926 W. Lake St., Chicago 12, Ill., is the manufacturer of the "Selectro" Vibrating Screens. These screens feature the Protecto-Back, designed to protect the wire cloth from stretching under the impact of wet solids during the shaking process.



These screens have found acceptance in many industrial waste disposal installations, and will do the desired job in handling tomato waste, canning wastes, tanning, and slaughter house waste materials. The mechanical vibratory screen can be had in any size mesh desired to do the job, and the device itself has many mechanical features which add to its usefulness and operating ability in the problem of handling wet solids and removing water therefrom.

To obtain further information on this "Selectro" Vibrating Screen, use a Reader Service Card on which is entered the above key number and your name and address.



CUT Installation Time!

Any water works man can see in a flash how Ford Ringstyle valves and couplings save pipe-fittings and installation time.

The meter nut is attached to the valve and the coupling by Ford's ingenious Ringstyle construction . . . . a sturdy bronze pin is driven through the nut and forms a ring behind the flange.

These fittings are described in our new catalog No. 50—it is FREE.

THE FORD METER BOX COMPANY, INC.

FOR BETTER WATER SERVICES FORD

Wabash, Indiana

1108

Saran Lined Pipe in Large Sizes

The Michigan Pipe Co., Bay City, Mich., has announced the production of large steel pipe and fittings lined with Saran rubber 187. This development complements the line of Saran lined pipe in smaller size ranges manufactured by the Dow Chemical Co.

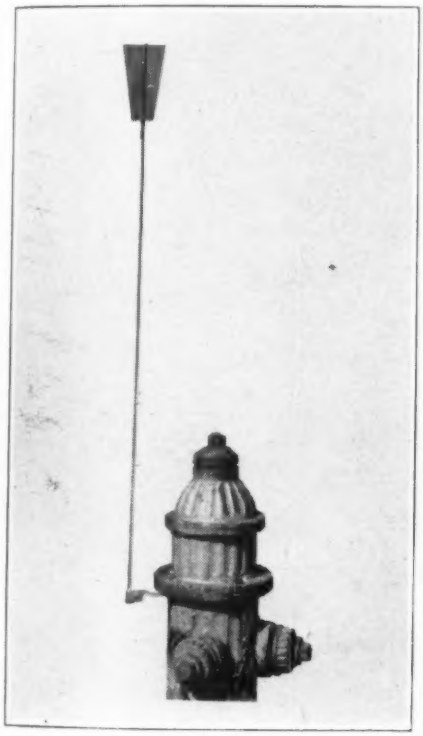
Saran rubber is especially resistant to abrasion. The standard lining is ⅛-in. thick and its operation temperatures range from -5 to 167 deg. F. Sizes of pipes lined include 8 to 36 in.

To obtain further information on Saran lined pipe, use a Reader Service Card on which is entered the above key number, and your name and address.

1109

Hydrant Marker

The American Metal Products Co., Worcester 8, Mass., is offering the "Sno-Mark" which locates snow-covered hydrants day or night. Consisting of a 7 inch bright red, luminescent enamel blazer mounted on a three or four foot steel pole, this "Sno-Mark" warns snow plow drivers and helps repair crews as well as showing water and fire departments the location of fire hydrants immediately after a heavy snow fall.



To obtain further information on this unit, use a Reader Service Card on which is entered the above key number and your name and address.

THE ANSWER IS ALWAYS THE SAME

Cleaning and Servicing of present pipe lines is more economical than replacement operations

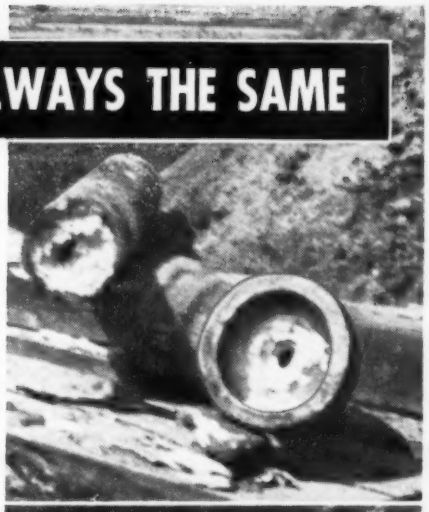


Photo A—Section of 4,645′ line of 8″ steel pipe before cleaning by rotary method.

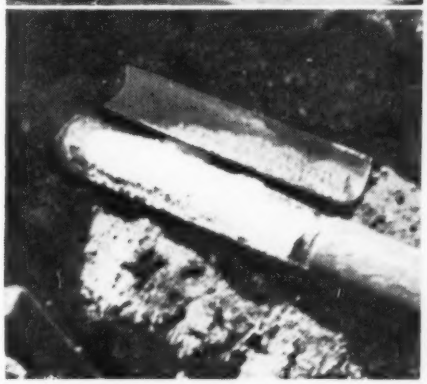


Photo B—Section of 1,020′ line of 14″ cast iron pipe before cleaning. Note that pipe is completely clogged.

Photos above illustrate pipe line conditions encountered by the Pittsburgh Pipe Cleaner Company in one cleaning operation for a midwest industrial firm. Note that pipe in photo A is almost completely plugged, while photo B pictures a pipe line that had been sealed with incrustations.

Successful cleaning of these long runs of pipe line again point to the fact that even in cleaning operations as extreme as those shown above, new construction and replacement costs continue higher in comparison with cleaning and servicing existing pipe line systems.

Before considering replacement operations, let us give you the facts and figures about the economy of cleaning as applied to your particular problems.

CONTACT YOUR PITTSBURGH PIPE CLEANER COMPANY ENGINEER TODAY!

PITTSBURGH PIPE CLEANER CO.
133 Dahlem St., Pittsburgh 6, Pa.
BALTIMORE • BIRMINGHAM • BOSTON • BRADENTON, FLORIDA • BUFFALO • CHARLOTTE
CHICAGO • CINCINNATI • DETROIT • HOUSTON • NEW YORK • PHILADELPHIA • ST. LOUIS

CAST IRON PIPE
BELL AND SPIGOT
WATER MAIN PIPE
CLASS 150 AND 250

2,100 ft.	4 in.
11,500 ft.	6 in.
9,250 ft.	8 in.
14,250 ft.	10 in.
2,450 ft.	12 in.

12 ft. and 18 ft. lengths
Priced below mill for immediate delivery in any quantity
Write—Wire—Phone

Sonken-Galamba Corporation
2nd & Riverview (X-482) Kansas City 18, Kansas
THatcher 9243

ZECO GREENSAND ZEOLITE

ZECO and HI-ZECO Greensand Zeolite for water softening, filtration and iron removal. ZECO Manganese Zeolite for iron and manganese removal. COREXITE mineral for corrosion control and water stabilization.

ZEOLITE CHEMICAL CO.
Sales Office: 140 Cedar St., New York, N. Y.
Factory: Medford, N. J.
Pioneer Producer of GREENSAND ZEOLITE MINERAL

1110

Multiple Outlet Strip

Eberbach & Son Co., Ann Arbor, Mich., has announced a new Multiple Outlet Strip. This laboratory accessory gives six electrical outlets conveniently spaced over a 3 ft. long strip case, thus eliminating the tangle of electric wires, where multiple plugs are used. It also avoids the dangers of inferior grade extension cords and plugs.

To obtain further information about this new unit, use a Reader Service Card, on which is entered the above key number and your name and address.

1111

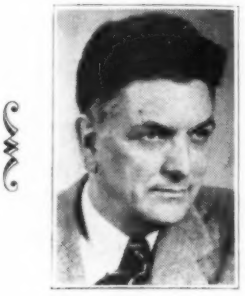
Chlorine Safety Precaution Chart

Solvay Sales Div., Allied Chemical and Dye Corp., has produced a new chlorine safety precaution chart for distribution to persons and companies using or handling liquid chlorine.

The chart measures 16½ by 23 in., and is designed to be hung wherever chlorine is handled. It contains information regarding emergency procedures in case of leakage, first aid recommendations, as well as general chlorine handling precautions. The chart is printed on a heavy yellow backing and is varnished to withstand exposure.

To obtain a copy of this very useful safety chart, use a Reader Service Card on which is entered the above key number and your name and address.

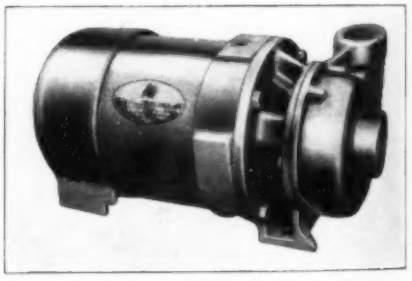
T. E. Woodruff Asst. Mgr. F-M Pump Div.



T. E. Woodruff, formerly manager of the St. Louis Branch House Pump Dept. for Fairbanks Morse & Co., has been appointed Ass't. Manager of the Pump Sales Div. with headquarters in Chicago.

1112

Side Suction Pump



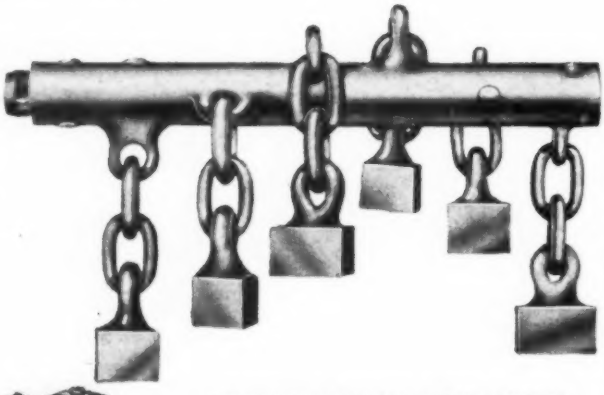
Aurora Pump Co., 68 Loucks St., Aurora, Ill., has announced the development of a small capacity, low head, side suction pump. Available in sizes of ¾ in., 1¼ in., and 2-in., the capacity ranges from 5 to 85 gpm. at heads of from 0 to 45 ft., with speeds from 1750 to 3500 rpm.

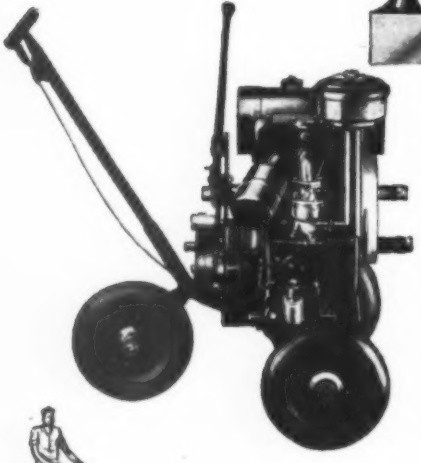
These units were designed for general service or for use as an integral part of equipment manufacturers' products.

To obtain further information on this unit use a Reader Service Card on which is entered the above key number and your name and address.

PRACTICAL PIPE LINE CLEANING TOOLS FOR PRACTICAL MEN

"Flexible" Power Tools for Cleaning Pipe in Short Sections—in Diameters Ranging from 4 Inches to 12 Inches.





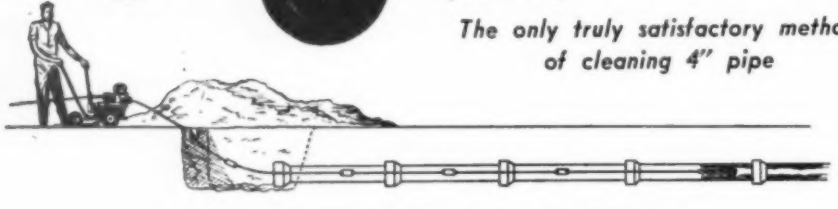
"FLEXIBLE" CHAIN HEAD AUGER

Cleans right down to the metal. Has never been known to break a pipe or damage a corporation cock. (Patented.)

"FLEXIBLE" POWER DRIVE

Powerful, portable power drive unit. Simple, safe to handle. Furnished with dependable 4 H.P., plus engine. (Patented.)

The only truly satisfactory method of cleaning 4" pipe



"FLEXIBLE" EQUIPMENT NOW FOR SALE, LEASE OR CONTRACT.

Write the nearest office today for full particulars.

FLEXIBLE UNDERGROUND PIPE CLEANING CO.

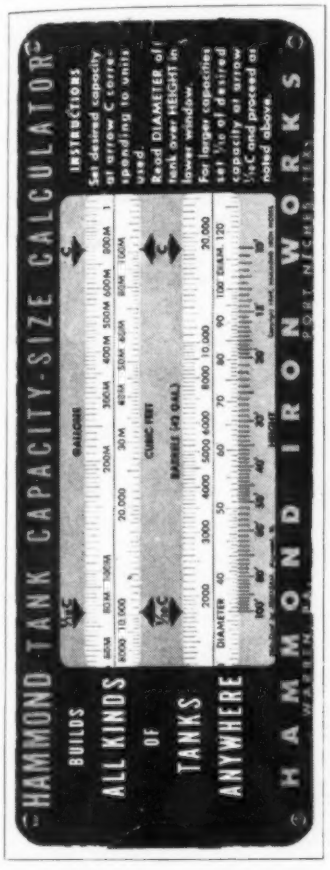
9059 Venice Blvd., Los Angeles 34, California

141 W. Jackson Blvd. Chicago, Ill.
29 Cordan Ave. Roslindale 31, Mass.
461 Broadway New York 13
P. O. Box 447 Lancaster, Texas
147 Hillside Ter. Irvington, N. J.
41 Greenway St. Hamden, Conn.
P. O. Box 165 Atlanta
3786 Durango Ave. Los Angeles 34, Calif.
2011 Central Ave. Memphis, Tenn.
909 N. Homewood Ave. Pittsburgh 8, Pa.
801 E. Excelsoir Blvd. Hopkins, Minn.
4455 S.E. 24th Ave. Portland 2, Ore.

1113

Tank Capacity Calculator

The Hammond Iron Works of Warren, Pa. (630 Fifth Ave., New York 20, N.Y.) has developed a slide rule type of calculator to show storage capacity in gallons and cubic feet in tanks from 10 to 100 ft. in height and from 20 to 120 ft. in diameter.



Also included on this calculator are the weights of steel plates, fractions and decimal equivalents from ⅛ of an inch to 117⅞ inches, and equivalent measurements of gallons, cubic feet and barrels with their weights in water.

To obtain one of these handy tank capacity size calculators, just fill in a Reader Service Card with the above key number and your name and address and mail it to this magazine.

Dorr Acquires Pan-American's Jig and Aerator

The Dorr Co. of New York City has acquired the rights to the metallurgical jigs and sewage aerators of the Pan-American Engineering Co., which is now in the process of liquidation. Design, production, and marketing of the equipment has been taken over by the Dorr Co.

W. G. Moore, formerly design engineer with Pan-American, has joined the engineering staff of the Dorr Co.

Burrell Changes Name

The Burrell Technical Supply Co. of 1942 Fifth Ave., Pittsburgh 19, Pa., has announced the change of the official name of the company. Henceforth it will be known under the name Burrell Corporation.

HAYS

CORPORATION and CURB STOPS

For Trouble-Free Water Service

CATALOG No. 5605

Hays Coupling for copper to male iron pipe connection.

CATALOG No. 5040

Hays Curb Stop for copper inlet to female iron pipe outlet.

CATALOG No. 5016

Hays Curb Stop with lockwing for iron pipe A.W.W.A. standard thread.

HAYS corporation and curb stops are easy to install and are interchangeable with the products of any other manufacturers. They are good for many long years of trouble-free service. They are made of the best 85-5-5-5 bronze and plugs are precision ground for perfect fit. They are hydrostatically tested at 200 pounds or more and specially lubricated for permanent easy turning. HAYS corporation stops can be installed with any standard tapping machine equipment.

The HAYS reputation for quality is the heritage of 80 years' insistence on honest craftsmanship and fair dealing. The Hays Manufacturing Company is one of the largest in the field and its name is a synonym for the best everywhere. Write for the new HAYS catalog of water works products for every purpose.

CATALOG No. 5200

Hays Corporation Stop with inlet A.W.W.A. standard thread.

HAYS

COPPER · BRASS · LEAD · IRON

WATER WORKS PRODUCTS

HAYS MANUFACTURING CO., ERIE, PA.

ANTHRAFILT

Trade Mark Reg. U. S. Patent Office

A Filter Medium For All Purposes

ANTHRACITE EQUIPMENT CORP.

Anthracite Institute Building
Wilkes-Barre, Pa.

All correspondence regarding sales and engineering should be addressed to:

PALMER FILTER EQUIPMENT CO.

822 E. 8th St. Erie, Pa.

Engineers and Sales Agents

LITERATURE AND CATALOGS

1114
METER SETTING EQUIPMENT

The Ford Meter Box Co., Inc., Wabash, Ind., has just issued its Catalog 50, on **Ford Setting and Testing Equipment for Water Meters.** Attractively bound and containing 94 pages, the catalog contains nine sections set off by handy index tabs for ready reference. These nine sections are: Installing Water Meters; Meter Boxes and Covers; Ford Yokes; Ford Copperhorns; Coppersetters & Linesetters; Ford Resetters; Ringstyle Valves and Couplings; GK and Angle Valves, Idlers, Branches, Adapters, Couplings; and Meter Testing.

In addition to containing diagrams and descriptions of products and their installation and use, the book is amply illustrated with photographs of actual installations. This is a book that every water department in the country should have.

To obtain a copy of this catalog, use a Reader Service Card on which is entered the above key number and your name and address.

1115
CHLORINIZER

The Builders-Providence Co., Inc. Division of Builders Iron Foundry, Providence 1, R.I., has issued a 4-page bulletin on the **Chlorinizer Volumetric Model DVS.** This 4-page bulletin shows a picture of the unit, a cutaway drawing of the unit, and a diagram of its operation. Also presented are a list of the features included in the Chlorinizer, a description of its operation, safety features, rate of flow indication, and construction and installation.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

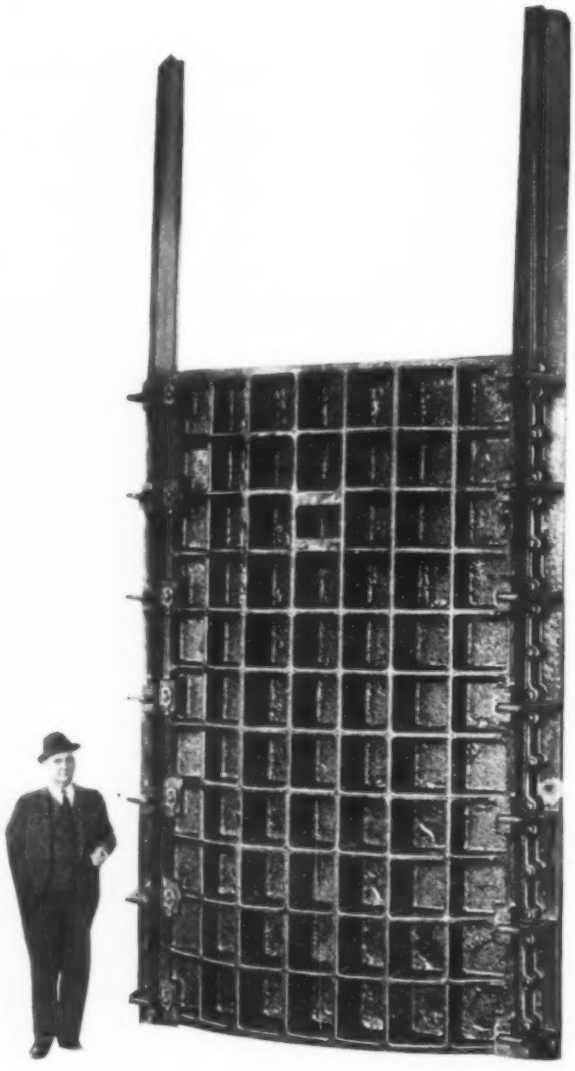
1116
WATER PRETREATMENT

The latest brochure published by the Dorr Co., 570 Lexington Ave., New York 22, is entitled **Dorr Equipment and Methods for Modern Water Pretreatment.** Shown in this bulletin are the following pieces of equipment: pre-sedimentation thickeners, flash mixers, the Dorrco Slaker, "Flocculator," the "Sifeed" clarifier, the "Squarex" clarifier, "Monorake," sludge removal equipment, the "Clariflocculator," the "Hydrotreator," Dorrco pumps, sludge thickeners and the D-I Systems. Also included in the bulletin are three flow sheets, showing how various pieces of equipment are used for pretreating highly turbid water, for color removal, and for softening.

To obtain a copy of this interesting brochure, use a Reader Service Card on which is entered the above key number and your name and address.

1117
SEWAGE SCREEN

Green Bay Foundry & Machine Works, Green Bay, Wis., has issued a new bulletin on the improved **"North" Sewage Screen.** This bulletin describes the latest development concerning the rotary sewage disposal screen (trunnion model). The trunnion wheel drive principle is used in place of the former gear tooth segment drive. Horsepower requirements have been cut in half, and the motor mounted overhead to conserve installation space. The bulletin describes this inexpensive equipment for primary treatment of raw sewage and gives capacity of the various



FILER & STOWELL SLUICE GATES

are built to stand long trouble free service. Amply proportioned for all stresses of shipment, erection and operation. They may be obtained with manual, hydraulic cylinder or motor operating controls.

THE FILER & STOWELL COMPANY
MILWAUKEE 7, WISC.

sized screen units from 4 to 10 feet. Also included in the bulletin is a description of methods of operation.

These North screens are effective in industrial waste treatment, particularly canning and tanning wastes and the like.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

1118
PAINTING CHARTS

The Inertol Co., Inc., 480 Frelinghuysen Ave., Newark 5, N.J., has issued two bulletins, one a **Water Works Painting Chart** and the other a **Sewage Plant Painting Chart.** Both present graphically and visually the various places where different kinds of paints and protective coatings manufactured by the company should be used. These bulletins are highly desirable for every superintendent and maintenance operator of either a water or a sewage plant.

To obtain a copy of either or both of these bulletins, use a Reader Service Card on which is entered the above key number and your name and address.

1119
CHLORINE TECHNICAL BULLETIN

Solvay Sales Division, Allied Chemical & Dye Corp., 40 Rector Street, New York City 6, N.Y., has issued a new edition of their Technical and Engineering Service Bulletin No. 7 titled **Liquid Chlorine.** This is the second edition of the bulletin that was issued several years ago. The new edition contains the latest information on properties of chlorine, chlorine containers, equipment and accessories, as well as instructions for safe handling and procedure in case of leakage or accident. The bulletin contains 60 pages and is fully illustrated with tables, charts, and diagrams.

To obtain a copy of this bulletin use a Reader Service Card on which is entered the above key number and your name and address.

1120
COUPLED STEEL WATER LINES

Dresser Mfg. Div., Bradford, Pa., has published a report of **Dresser Coupled Steel Water Lines** in the year 1948. This 12-page bulletin contains pictures of actual installations, with data on the installations at various numbers of cities throughout the United States. Shown in the bulletin are pipe lines of 24 in. diameter up to 76 in. A variety of installations and installation conditions are shown, as well as different types of applications.

This highly interesting book on coupled steel water lines may be obtained by using a Reader Service Card on which is entered the above key number and your name and address.

1121
PARSHALL FLUME AND WEIR DATA

The Foxboro Co., Foxboro, Mass., has begun a series of service publications for public utility men, contractors and engineers. The first of these bulletins on **Application Engineering Data** is on the Parshall Flume and Weir Flow Recording Controller. This series of Application Engineering Data bulletins is intended as a practical tool for use in planning and estimating and in preparing specifications. In this particular publication the data contains dimensional diagrams for different types of flumes and weirs, tables of flow valves, specifications for standard instruments, etc.

To obtain a copy of this interesting bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

Which of These Technical Bulletins Can You Use?

Whether you are a water plant operator or engineer, these SOLVAY Technical Bulletins should be in your reference library. The answers to many problems concerning water treatment, the handling and storage of liquid chlorine, and water analysis can be found in these three bulletins.

This authentic material and information is the result of many years of research and study. It can be of great value in helping to clear up technical water plant problems; it is also an excellent reference material. Get any one or all three of these important books now—there's no cost or obligation. Simply fill in and mail the coupon for these SOLVAY Technical Bulletins.

For Water Conditioning

SOLVAY

TRADE-MARK REG. U. S. PAT. OFF.

LIQUID CHLORINE

SODA ASH

SOLVAY SALES DIVISION, Allied Chemical & Dye Corporation
40 Rector Street, New York 6, N.Y.

Please send me, without obligation, the SOLVAY Technical Bulletins I have checked below.

- ☐ Bulletin No. 7—LIQUID CHLORINE
- ☐ Bulletin No. 8—ALKALIES AND CHLORINE IN THE TREATMENT OF MUNICIPAL AND INDUSTRIAL WATERS
- ☐ Bulletin No. 11—WATER ANALYSIS

Name_____

Company_____

Address_____

City_____ State_____ 11

A DEPENDABLE JOINTING COMPOUND

FOR BELL AND SPIGOT WATER MAINS

HYDRO-TITE

HYDRAULIC DEVELOPMENT CORP.
MAIN SALES OFFICE • General offices and works
50 CHURCH ST. N.Y.C. • W. Medford Sta. Boston, Mass.

1122

DIAPHRAGM VALVES

The Crane Co., 836 S. Michigan Ave., Chicago 5, Ill., has issued a bulletin on **Diaphragm Valves.** This bulletin describes the newest development in diaphragm valves and presents the basic improvement on conventional packless valve design. The place of the diaphragm valve principle in industrial fluid handling is discussed as are exclusive features of the new design. Cutaway drawings and descriptive items of various features are included as are dimensions.

To obtain a copy of this bulletin on Diaphragm Valves, use a Reader Service Card on which is entered the above key number and your name and address.

1123

VERTICAL TURBINE PUMPS

Worthington Pump & Machinery Corp., 401 Worthington Ave., Harrison, N.J., has issued a folder on the **Worthington Vertical Turbine Pumps.** These are the type Q water lubricated pumps in sizes from 6 in. to 14 in. and having capacities from 50 to 3000 gpm. The folder shows a complete cutaway drawing of the use, the design and operation of the pump with each of the parts labeled. Specific elements of the bowl and design features are also discussed.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

1124

CORROSION PROOF VALVES

Walworth Valves and Fittings, 60 E. 42nd St., New York 17, N.Y., makers of lubricated plug valves, has issued an article on **"Valves To Combat Corrosion"** in a recent issue of their house organ known as *Walworth Today.* The article describes valves made of better known corrosion resistant alloys such as monel metal, pure nickel, acid-resisting bronze, etc.

If you are interested in this subject of corrosion proof valves, or in plug valves, use a Reader Service Card on which is entered the above key number and your name and address.

1125

PAYLOADER

The Frank G. Hough Co., Libertyville, Ill., has issued an interesting bulletin describing the **Payloader.** The bulletin employs "the light

THE SILENT WATCHMAN

DIXIE TANK AND BRIDGE CO.
3523 LAMAR AVE. P. O. BOX 14
MEMPHIS 1, TENNESSEE

Complete Service for Elevated Water Tanks—
Nation Wide Service—30 Years Experience

KEEP THE SAFETY FACTOR IN YOUR TANK THE DIXIE WAY

By welding seams, pits and rivets which gives a riveted tank 15% more Safety Factor than it had when built. No rivets removed, water supply maintained while work is in progress. On completely reconditioned jobs, the painting is guaranteed for five years, repairs guaranteed for ten years, provided the tank is painted every five years. Yearly inspection, making all adjustments, if any, without additional cost.

Write Us for Free Copy of Publication
SOUND PRINCIPLES OF WATER TANK MAINTENANCE and TANK TALK, by W. A. RILEY
—SAFETY—SERVICE—SATISFACTION—
COPYRIGHT 1949
THE LARGEST ORGANIZATION OF ITS KIND GIVING SAFE MAINTENANCE AT LOW COST

touch" in its presentation of the qualifications and applications of this particular type of machine. The uses in a water plant to which this machine can be applied has been amply described in the pages of *Water & Sewage Works* in the September, 1948, issue.

To obtain a copy of this interesting little bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

1126
CHEMICAL FEEDER

Infilco, Inc., 325 W. 25th Place, Chicago 16, Ill., has issued a bulletin on **Type E Dry Chemical Feeder.** The bulletin describes equipment and presents the principle of operation, details of design and details of construction and installation. A selection table is included showing the range of maximum capacities in pounds per hour for various chemicals.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

1127
CENTRIFUGAL PUMPS

Allis-Chalmers Mfg. Co., 1192 S. 70th St., Milwaukee, Wis., has issued a bulletin on the **Allis-Chalmers Type S Single Stage, Double Suction Centrifugal Pumps.** This 24-page bulletin describes construction features of these pumps, which are developed to serve a specific need for high efficiency and low maintenance. The bulletin carries tables of available sizes, approximate dimensions and head capacities, tells how to figure pumping head, and tabulates friction loss for water per 100 feet of pipe. These pumps have been used in water and sewage plants as well as industrial waste treatment.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

1128
FIRE HYDRANTS

Darling Valve & Mfg. Co., Williamsport, Pa., has available a 4-page folder on **Darling Fire Hydrants.** This folder shows a number of photographs of cities where Darling Hydrants are installed. Also included is a cut-away drawing of all the essential features of the hydrants.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

"GUNITE" ENLARGES AND IMPROVES RESERVOIR

In 1947 we "GUNITED" the West End Reservoir at Hagerstown, Maryland. The pictures clearly show important stages in our work to give it greater capacity and to stop excessive leakage. After existing cracks in the concrete floor were sealed, "GUNITE" was applied to waterproof and reinforce the stone masonry and to add 30 inches to the height of the walls.

Many instances of repair, remodeling and new construction with "GUNITE" are described and pictured in Bulletin C2400. A request on your letterhead will bring your free copy by return mail.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.
MANUFACTURERS OF THE CEMENT GUN

You can't afford to miss it!

WATER AND SEWAGE WORKS

A magazine which specializes in water supply, sewage disposal and industrial waste, to help you solve your problems.

Read by over 735 Consulting Engineers who specialize in this field—a significant testimony to the quality and reliability of the publication.

If not a subscriber—place your order NOW and be sure of a copy of the new revised REFERENCE AND DATA NUMBER. Fill in coupon, and mail today to

WATER AND SEWAGE WORKS
22 W. MAPLE ST. CHICAGO, ILL.

☐ 1 yr. $2.00 ☐ 2 yrs. $3.00

Name

Title and Dept. or Firm

Street Address Zone

City State

COMPARE These Features!

- EXACT location of buried pipes, mains, services, gates, tees, ells, stubs, etc.
- Weighs only 11 lbs. complete—one man operation!
- New electronic circuit provides strong, positive location signal.
- Uses standard miniature radio tubes and flashlight batteries.
- Lasts a lifetime—guaranteed superior performance.

Goldak Invites Comparison

Does the work of a Heavyweight

GOLDAK
Featherweight
PIPE LOCATORS

The GOLDAK Co.
Leading Makers of PIPE LOCATORS Since 1933
1543 WEST GLENOAKS BLVD
GLENDALE 1, CALIFORNIA

HYDRANTS, VALVES & PIPE LINE ACCESSORIES

Hub Ends, Mechanical Joints, Flanged or Screwed.

Write for Catalog No. 34

VALVES: A.W.W.A. type iron body, bronze mounted with double-disc parallel seat or solid wedge type. Non-rising stem, outside screw and yoke, or with sliding stem and lever. Also furnished hydraulically operated. Square bottom type operates in any position.

HYDRANTS: Standard A.W.W.A. type approved by Underwriters and Factory Mutuals.

LEFT:
HYDRAULIC GATE VALVE
For quick and easy operation by remote control.

M & H PRODUCTS INCLUDE

FIRE HYDRANTS
GATE VALVES
TAPPING VALVES
WALL CASTINGS
SPECIAL CASTINGS
TAPPING SLEEVES
CHECK VALVES
FLOOR STANDS
EXTENSION STEMS
SHEAR GATES
MUD VALVES
VALVE BOXES
FLAP VALVES
SLUDGE SHOES
FLANGE AND FLARE FITTINGS
FLANGED FITTINGS
B & S FITTINGS
CUTTING-IN TEES

M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

1129
STEEL VALVES

The Chapman Valve Manufacturing Co., Indian Orchard, Mass., has issued a catalog on **Steel Valves.** This 44-page catalog presents a complete description of all gate, globe, angle and check valves manufactured by the Chapman Co. It contains photographs, diagrams and tables of specifications.

To obtain a copy of this catalog, use a Reader Service Card on which is entered the above key number and your name and address.

1130
PROPORTIONAL FEEDER

% Proportioneers, % Inc., 9 Codding St., Providence 1, R.I., has issued a bulletin on the **Heavy Duty Chemo-Feeder.** This proportional chemical feeder is universally applicable for the feeding of many chemicals. The bulletin shows the installation and use of the feeder and describes the diagrams, construction, operation, and installation. Various types and sizes are discussed.

To obtain a copy of this bulletin on a proportional control feeder, use a Reader Service Card on which is entered the above key number and your name and address.

1131
DIATOMITE FILTER

The Permutit Co., 330 W. 42nd Street, New York 18, N.Y., has issued a 4-page folder on the **Permutit Diatomite Filter,** presented especially for use with swimming pools. The folder shows a diagram of the installation of the unit and explains the advantages which include less space, high degree of filtration, reduced cost of coagulants, saving in wash water and better filter washing, as well as an improved type of filter element. The bulletin also explains how the Permutit Diatomite Filter operates.

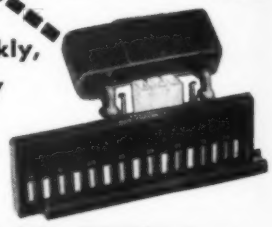
To obtain a copy of this bulletin use a Reader Service Card on which is entered the above key number and your name and address.

1132
DE LAVAL PRODUCTS

De Laval Steam Turbine Co., Trenton 2, N.J.. has issued a bulletin on **Products of De Laval.** This 24-page bulletin contains a complete presentation of all of the products made by the company, including steam turbines of various types, helical gears, centrifugal pumps of particular interest to the water and sewage works field, multi-stage

on the spot **CHLORINE DETERMINATIONS**

made quickly, accurately with a



TAYLOR-ENSLOW SLIDE CHLORIMETER

The ideal instrument for determining the free or residual chlorine content of water, sewage or industrial wastes.

Taylor-Enslow slides are molded of durable plastic and contain a complete set of 9 sealed color standards. Two slides are available: 0.0 to 1.0 p.p.m. and 0.0 to 3.0 p.p.m. of chlorine. All Taylor liquid color standards carry an unlimited guarantee against fading. Combination pH and Chlorine sets, and complete Taylor Water Analyzer sets are also available. All sets are easily portable.

READ THIS INFORMATIVE BOOK

Write direct for "Modern pH and Chlorine Control" . . . gives valuable data for all water and sewage operators . . . describes Taylor outfits. See your dealer for equipment.

W. A. TAYLOR AND CO.
7308 YORK RD. • BALTIMORE-4, MD.

LEADITE
The Pioneer Self-Caulking Material for C.I. Pipe

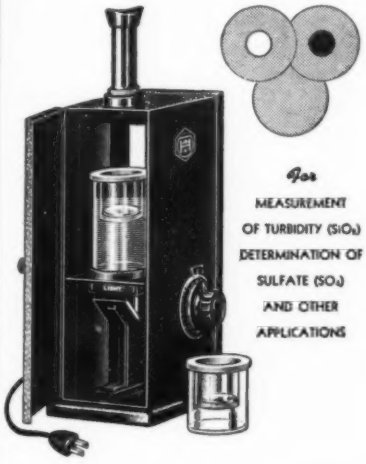
TABLE OF COMPARATIVE QUANTITIES

Nominal inside dia. of pipe, in.	Depth of joint, inches of Leadite	Approx. lbs. of Leadite per joint	Depth of joint, inches of lead	Approx. lbs. of lead per joint
4	2.5	2.00	2.25	8.56
6	2.5	3.00	2.25	11.71
8	2.5	4.00	2.25	14.63
10	2.5	5.00	2.25	17.70
12	2.5	6.00	2.25	20.86
14	2.5	7.00	2.25	24.02
16	2.5	8.25	2.25	33.07
18	2.5	9.25	2.25	36.88
20	2.5	10.50	2.25	40.71
24	2.5	13.00	2.50	53.02
30	2.75	16.00	2.50	65.36
36	2.75	19.00	2.50	77.96
48	3.50	30.00	3.00	121.15
54	4.0	38.00	3.00	135.60
60	4.0	42.00	3.00	150.70

THE LEADITE COMPANY
Girard Trust Co. Bldg., Philadelphia 2, Pa.

No Caulking

HELLIGE
TURBIDIMETER
A TURBIDIMETER WITHOUT STANDARDS
Accurate • Foolproof • Universal



For MEASUREMENT OF TURBIDITY (SiO_2) DETERMINATION OF SULFATE (SO_4) AND OTHER APPLICATIONS

WRITE FOR CATALOG No. 8000
HELLIGE
INCORPORATED
3718 NORTHERN BLVD., LONG ISLAND CITY 1, N.Y.

Peace of Mind

Operators of Roberts-equipped filtration plants have been telling us for years that our continuing interest in helping them keep their plants at peak efficiency, is a service on which they depend — from incidental replacement parts to million gallon per day additions.

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

ROBERTS FILTER MANUFACTURING CO.
607 COLUMBIA AVE., DARBY, PA

pumps, the Imo pump, blowers and compressors and worm gear speed reducers. Also listed are all the sales offices of the company.

To obtain a copy of this bulletin use a Reader Service Card on which is entered the above key number and your name and address.

1133

CYANIDE WASTE TREATMENT

Link-Belt Co., Philadelphia, Pa., has published in the June-July issue of the **Link-Belt News,** a story on "Removing Toxic Metals and Cyanides in Waste Waters." This story concerns Talon, Inc., manufacturers of zippers, at Meadville, Pa. The story tells of the construction and placing in operation of a waste treatment plant costing half a million dollars to prevent the pollution of French Creek.

To obtain a copy of the *Link-Belt News,* which contains this story on industrial waste treatment, use a Reader Service Card on which is entered the above key number and your name and address.

1134

WATER ANALYSES

W. H. & L. D. Betz, Gillingham and Worth St., Philadelphia 24, Pa., has issued a bulletin on **Testing and Control Equipment for Water Analyses.** Included in the brochure are brief descriptions of the testing and control equipment necessary for the more common water analyses, with illustrations of the same.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

1135

PRELOAD TANKS

The Preload Corp., 211 E. 37th St., New York 16, N.Y., has released a bulletin on **Preload Tanks.**

This 26-page bulletin contains a discussion of the evolution of prestressed concrete tanks, the uses of such tanks, construction, design, specifications, etc. Also included are many pictures of actual installations, both before and after completion of construction. A series of questions and answers are given, as is a list of municipalities and private industries which have made use of this type of prestressed concrete tank.

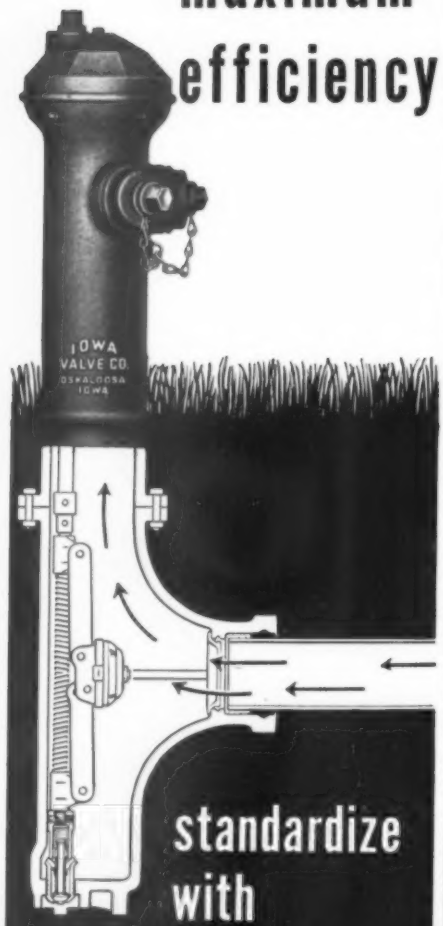
This is a highly informative bulletin. It may be obtained by using a Reader Service Card on which is entered the above key number and your name and address.

3 way dependability

1. **IN CASE OF FIRE**—dependable, smooth operation . . . clear, large waterways . . . insure plenty of water. Hydrants open fast and easily *with* the pressure . . . and close without water hammer.
2. **IN CASE OF ACCIDENT**—stem held in place below main valve means no water loss due to a bent stem. One man can easily remove all operating mechanism for inspection or repairs.
3. **IN CASE OF LOW TEMPERATURES**—Eddy's positive drip action automatically drains hydrant barrel of all water when hydrant is closed . . . safeguards hydrant against freeze-ups.

EDDY
VALVE COMPANY
WATERFORD NEW YORK
A subsidiary of James B. Clow & Sons

for maximum efficiency



standardize with IOWA hydrants

Two piece operating nut with special adjustment screw solves the problems of expansion and contraction . . . makes Iowa hydrants easy to operate at all times.

Positive operating mechanical drain valve can be removed along with all other working parts through top of hydrant without special tools.

Fixed position of valve arms makes leaking impossible should standpipe be broken.

Unrestricted water flow gives full pressure at extreme low loss of head.

Built to conform to the latest A.W.W.A. specifications.

IOWA VALVE COMPANY

201-299 N. Talman Avenue • Chicago 80, Illinois

A subsidiary of James B. Clow & Sons

1136

SLIDE COMPARATORS

The W. A. Taylor Co., 7300 York Road, Baltimore 4, Md., has available a pocket size catalog on the **Taylor Slide Comparators.** These comparators are for the determination of pH, chlorine and phosphate control, and for water analysis.

To obtain a copy of this catalog, use a Reader Service Card on which is entered the above key number and your name and address.

1137

CHEMICAL PRODUCTS

General Chemical Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N.Y., has just issued a bulletin, **"General Chemical Products Book."** This 176-page bulletin is amply illustrated and contains descriptions of all of the chemicals made by the company, including those used in water supply, sewage disposal, and industrial waste treatment.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

1138

WATER HAMMER

The Williams Gauge Co., 1620 Pennsylvania Ave., Pittsburgh 12, Pa., has reprinted an article on **"Water Hammer—Cause, Effect and Control in Piping Systems."** The article in question is reprinted from *Industrial Power* (including Plant Maintenance) and is written by J. A. Hager of the Williams Gauge Company. Without delving too deeply into technicalities the author presents a useful understanding of what happens when water hammer is encountered and what preventive measures should be taken.

To obtain a copy of this reprint use a Reader Service Card on which is entered the above key number and your name and address.

1139

TAPPING VALVES AND SLEEVES

Mueller Co., Chattanooga, Tenn., has issued a 4-page folder on **Mueller Tapping Valves, Tapping Sleeves and Repair Sleeves.** Presented as the answer to connection problems, the bulletin shows valves and tapping valves as well as repair sleeves and their sizes and uses.

To obtain a copy of this bulletin use a Reader Service Card on which is entered the above key number and your name and address.

JEFFREY— SPECIALISTS IN SANITATION

Many successful installations . . . plants serving from 2500 to several million population . . . bear evidence of the carefully-designed units (patented) in the Jeffrey line for water and sewage treatment. Our engineers are specialists . . . will offer technical data on both equipment and design.

Bar screens
Chemical feeders
Floctrols (R) controlled flocculation
Grit collectors
Grit washers
Sludge elevators
Scum removers
Sludge collectors
Screenings grinders
Also equipment for biofiltration plants

Efficient performance with Jeffrey's modern methods

The Jeffrey Mfg. Co.

996 N. 4th Street, Columbus 16, Ohio

Baltimore, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Harlan, Houston, Huntington, Jacksonville, Milwaukee, New York, Philadelphia, Pittsburgh, St. Louis, Salt Lake City, Scranton

Leopold

GLAZED FIRE CLAY TILE FILTER BOTTOM

• Permanent • Non-corrosive • Economical • Impervious to acid or alkali solutions • Practically non-absorbent • Equal distribution.

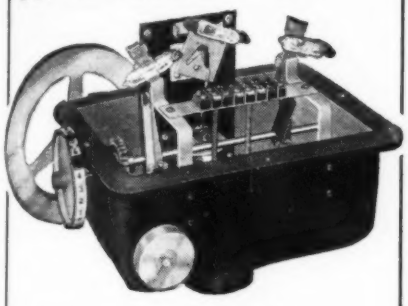
Complete water purification and sewage plant equipment.

Write today for complete information

F. B. LEOPOLD CO., INC.

2413 W. CARSON ST. PITTSBURGH 4, PA.

RF-2 Roto-Trol



with Alto-Trol

PUTS THAT SECOND PUMP TO WORK

Equal use and wear of both pumps is assured with a 2-pump *RF-2 ROTO-TROL* with a built-in *ALTO-TROL*. It operates each pump on alternate starting cycles. It operates both pumps when the demand requires.

RF-2 ROTO-TROL is furnished in a Cast Iron Cabinet. Float operated through stainless steel tape. Also available in from two to eight circuits for sequence control. Depth Indicator optional—extra.

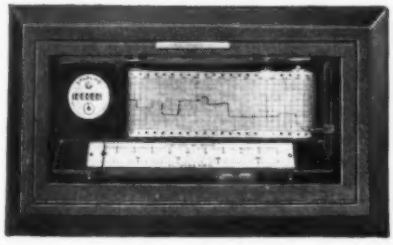
Write for Engineering Data

Water Level Controls Division of

HEALY-RUFF COMPANY

783 HAMPDEN AVE., ST. PAUL 4, MINN.

SPARLING
Main-Line Meters



IF accuracy in Main-Line Metering means anything to you—

IF ease of installation and maintenance are considerations—

IF negligible pressure loss through the meter is desirable—

IF cost is a factor—

YOU NEED *SPARLING* METERS

Bulletin 310 comes upon request

The SPARLING
Manufacturers of WATER MEASURING EQUIPMENT

Los Angeles 54.....Box 3277 Terminal Annex
Chicago 8.....1500 South Western Ave.
Cincinnati 2.....622 Broadway
New York 17.....101 Park Avenue
Boston 8.....6 Beacon Street
Seattle 1.....1932 First Avenue
Dallas 1.....726 Reserve Loan Life Bldg.

1140

HOOKER CHEMICALS

The Hooker Electrochemical Co., Niagara Falls, N.Y., has issued a catalog titled **General Products List 1949-50.** The bulletin contains as its title indicates a complete listing of Hooker Chemicals with the properties of each chemical.

To obtain a copy of this General Products List, use a Reader Service Card on which is entered the above key number and your name and address.

1141

UNICLOSED MOTOR

U. S. Electrical Motors, Inc., 200 E. Slausen Ave., Los Angeles 54, Calif., has issued a colorful bulletin on its **Uniclosed Motor.** By use of dramatic natural color photo reproductions and progressive drawings, special features of the Uniclosed design are shown. These features include armor-clad, asbestos-protected windings, drip-proof housing, lubriflush lubrication, normalized castings, cyclone ventilation, etc.

To obtain a copy of this interesting and attractive folder, use a Reader Service Card on which is entered the above key number and your name and address.

1142

SEWER CONSTRUCTION

The Clay Sewer Pipe Assn., Inc., 1105 Huntington Bank Bldg., Columbus 15, Ohio, has issued a small pamphlet on **"Good Practice In Sewer Construction."** The handy pocket-size folder contains information on good trenching, bedding, yielding trench bottoms and finishing.

To obtain one of these pocket folders, use a Reader Service Card on which is entered the above key number and your name and address.

1143

EVERDUR METAL

The American Brass Co., Waterbury, Conn., has available a bulletin on **Everdur Metal,** for sewage treatment equipment, reservoir, and water works service.

The bulletin describes the use of Everdur Metal in sewage treatment works and shows pictures of its application. Also shown are the uses of various items of Everdur Metal in water purification plants and in reservoirs.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

WATER HAMMER
can cost
a **Fortune**

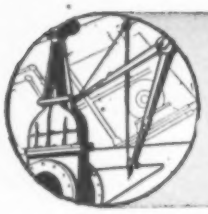
yet it costs so little to correct with
THE WILLIAMS-HAGER
flanged SILENT CHECK
VALVE

Used and specified on hundreds of new buildings—and installed on thousands of old buildings to prevent costly "Water Hammer"—the Williams-Hager Flanged Silent Check Valve will solve your problem, too! Write for new technical bulletin.

THE WILLIAMS GAUGE CO.

Pump Valves . . . Water Gauges . . . Gauge Cocks . . . Steam Traps . . . Pump Governors . . . Feed Water Regulators . . . Water Columns

2000 PENNSYLVANIA AVE. · PITTSBURGH (12), PA.



Consulting Engineers

SPECIALIZING IN THE FIELD OF

WATER & SEWAGE WORKS

ALBRIGHT & FRIEL, INC.

Consulting Engineers

Water, Sewage and Industrial Waste Problems — Airfields, Refuse Incinerators, Power Plants — Industrial Buildings
City Planning—Reports—Valuations

Laboratory

121 South Broad Street, Philadelphia 2, Pa.

Clinton L. Bogert Associates

CONSULTING ENGINEERS

Clinton L. Bogert — Ivan L. Bogert
J. M. M. Greig — Robert A. Lincoln
Donald M. Ditmars — Arthur P. Ackerman

Water & Sewage Works
Refuse Disposal — Industrial Wastes
Drainage — Flood Control

624 Madison Avenue, New York 22, N.Y.

DE LEUW, CATHER & COMPANY

Water Supply — Sewerage
Railroads — Highways
Grade Separations—Bridges—Subways
Local Transportation

Investigations — Reports — Appraisals
Plans and Supervision of Construction

150 North Wacker Drive, Chicago
79 McAllister Street, San Francisco 2, Calif.

Alvord, Burdick & Howson

Engineers

Charles B. Burdick
Louis R. Howson
Donald H. Maxwell

Water Works, Water Purification, Flood Relief, Sewerage, Sewage Disposal, Drainage, Appraisals, Power Generation

Civic Opera Building, Chicago

Bowe, Albertson & Associates

ENGINEERS

Sewerage—Sewage Treatment
Water Supply—Purification
Refuse Disposal—Analyses
Valuations—Reports—Designs

110 William St., New York 7, N. Y.
2082 Kings Highway, Fairfield, Conn.

Fay, Spofford & Thorndike

Engineers

Charles M. Spofford — Ralph W. Horne
John Ayer — William L. Hyland
Bion A. Bowman — Frank L. Lincoln
Carroll A. Farwell — Howard J. Williams

Water Supply and Distribution — Drainage
Sewerage and Sewage Treatment — Airports
Investigations and Reports
Designs — Valuations
Supervision of Construction

Boston, New York

ARGRAVES & MORT

ENGINEERS

Sewerage and Sewage Treatment
Refuse Disposal—Industrial Wastes
Water Supply and Purification—Dams

70 COLLEGE ST. NEW HAVEN, CONN.

Buck, Seifert and Jost

Consulting Engineers

(Formerly Nicholas S. Hill Associates)
Water Supply, Sewage Disposal, Hydraulic Developments, Reports, Investigations, Valuations, Rates, Design Construction Operation Management, Chemical and Biological Laboratories

112 East 19th St., New York

GANNETT FLEMING CORDDRY AND CARPENTER, INC.

ENGINEERS

Pittsburgh, Pa. — Scranton, Pa.
HARRISBURG, PA.

Water Works, Sewage, Industrial Wastes & Garbage Disposal—Roads, Airports, Bridges & Flood Control. Town Planning, Appraisals, Investigations & Reports.

JOHN J. BAFFA

Consulting Engineer

Water Supply and Treatment
Sewerage and Sewage Treatment

75 West Street, New York 6, N. Y.

BURNS & McDONNELL ENGINEERING COMPANY

Consulting Engineers 50th Year

Water Works, Light and Power, Sewerage, Rate Investigations, Reports, Designs, Appraisals

P.O. Box 7088, Country Club Sta.; Office, 95th and Troost Avenue, Kansas City 2, Missouri

GILBERT ASSOCIATES, INC.

Engineers and Consultants

Water Supply and Purification
Sewage and Industrial Waste Treatment
Chemical Laboratory Service
Investigations and Reports

New York — Reading, Pa. — Washington
Houston — Philadelphia

Michael Baker, Jr.

The Baker Engineers

CIVIL ENGINEERS AND PLANNERS
MUNICIPAL ENGINEERS

Airport Design—Sewage Disposal Systems
Water Works Design and Operation
Consulting Services — Surveys and Maps

HOME OFFICE—ROCHESTER, PA.

Camp, Dresser & McKee

Consulting Engineers

6 Beacon Street, Boston 8, Mass.

Water Works and Water Treatment; Sewerage and Sewage Treatment; Municipal and Industrial Wastes; Investigations and Reports; Design and Supervision; Research and Development; Flood Control.

Ivan M. Glace

Consulting Sanitary Engineer

WATER SUPPLY AND PURIFICATION
SEWERAGE AND SEWAGE TREATMENT

Design, Construction and Supervision of Operation

Telephone 6-0407
1001 North Front St., Harrisburg, Pa.

W. H. & L. D. BETZ

CONSULTANTS ON ALL WATER PROBLEMS

Process, Boiler and Municipal Water • Waste and Sewage Treatment • Consultation • Design • Analysis

PHILADELPHIA 24, PENNA.

CAPITOL ENGINEERING CORPORATION

Engineers—Constructors—Management

SEWAGE SYSTEMS — WATER WORKS
Designs and Surveys — Roads and Streets
Planning — Airports
Bridges — Dams

Executive Offices
DILLSBURG, PENNSYLVANIA

WILLIAM A. GOFF, INC.

General Engineering and Consulting Services—Water, Sewerage, Refuse Incineration, Industrial Buildings, Power Plants, Airport, Town Planning Plans, Supervision, Valuations, Reports

Broad St. Station Bldg., Philadelphia 3, Pa.

BLACK & VEATCH

Consulting Engineers

Water — Sewage — Electricity
Industry

Reports, Design, Supervision of Construction, Investigations, Valuation and Rates

4706 Broadway, Kansas City 2, Missouri

The Chester Engineers

Water Supply and Purification, Sewerage and Sewage Treatment, Power Development and Applications, Investigations and Reports, Valuations and Rates.

210 E. Park Way at Sandusky, Pittsburgh 12, Pa.

GREELEY AND HANSEN

Engineers

Samuel A. Greeley — Paul Hansen (1920-1944)
Paul E. Langdon — Kenneth V. Hill
Thomas M. Niles — Samuel M. Clarke

Water Supply, Water Purification
Sewerage, Sewage Treatment
Flood Control, Drainage, Refuse Disposal

220 S. State Street, Chicago 4

Havens & Emerson

W. L. Havens C. A. Emerson
A. A. Burger F. C. Tolles F. W. Jones

Consulting Engineers

Water, Sewage, Garbage, Industrial Wastes, Valuations—Laboratories

Leader Building, Cleveland 14 — Woolworth Bldg., New York 7

Hayden, Harding & Buchanan

Consulting Engineers

John L. Hayden
John H. Harding Oscar J. Campia

Waterworks, Sewerage, Civil, Mechanical, Electrical, Structural

826 Park Square Building, Boston, Mass

Charles Haydock

Consulting Engineer

Water Works and Sanitation, Industrial Wastes, Design, Construction, Operation and Management. Reports and Valuations.

COMMERCIAL TRUST BUILDING
PHILADELPHIA 2

Jones, Henry & Schoonmaker

(Formerly Jones & Henry)

Consulting Sanitary Engineers

Water Works
Sewerage & Treatment
Waste Disposal

Security Bldg. — Toledo 4, Ohio

ENGINEERING OFFICE OF CLYDE C. KENNEDY

COMPLETE ENGINEERING SERVICE
For More Than a Quarter Century

Investigations, Reports, Design, Supervision of Construction and Operation
Water Supply, Water Conditioning, Sewerage, Sewage and Industrial Waste Treatment

CHEMICAL and BIOLOGICAL LABORATORY
604 Mission Street — San Francisco, 5

Morris Knowles, Inc.

Engineers

Water Supply and Purification, Sewerage and Sewage Disposal, Valuations, Laboratory, City Planning

1312 Park Building, Pittsburgh, Pa.

WM. S. LOZIER CO.

Sewerage, Sewage Disposal, Water Supply, Water Purification
Refuse Disposal

Consulting Engineers

10 Gibbs Street — Rochester 4, N. Y.

Metcalf & Eddy

Engineers

Water, Sewage, Drainage, Refuse and Industrial Waste Problems
Airfields Valuations
Laboratory

Statler Building, Boston

MOORE & OWEN

Engineers

WATER, SEWAGE, INCINERATION
REFUSE DISPOSAL, AIRFIELDS
COMPLETE WATER & SEWAGE
LABORATORIES, INDUSTRIAL WASTES

1456 N. DELAWARE ST.
INDIANAPOLIS 2, IND.

Nussbaumer, Clarke & Velzy, Inc.

Newell L. Nussbaumer Irving Clarke

Water Supply and Treatment
Sewerage & Sewage Disposal
Garbage Incineration
Town Planning

52 Vanderbilt Ave., N. Y. City
327 Franklin St. — Buffalo, N. Y.

PARSONS, BRINCKERHOFF, HALL & MACDONALD

G. Gale Dixon, Associate

ENGINEERS

Dams, Water Works, Sewerage, Airports, Bridges, Tunnels, Traffic & Transportation Reports, Highways, Subways, Foundations, Harbor Works, Valuations, Power Developments, Industrial Buildings

51 Broadway, — New York 6, N. Y.

Malcolm Pirnie Engineers

Civil & Sanitary Engineers

Malcolm Pirnie Ernest W. Whitlock
Richard Hazen G. G. Werner, Jr.

Investigations, Reports, Plans
Supervision of Construction and Operations
Appraisals and Rates

25 West 43rd St., New York 18, N. Y.

The Pitometer Company

Engineers

Water Waste Surveys, Trunk Main Surveys, Water Distribution Studies
Penstock Gaugings

New York, 40 Church St.

LEE T. PURCELL

Consulting Engineer

Water Supply and Purification
Sewerage and Sewage Disposal
Industrial Wastes
Design, Supervision of Construction and Operation
Complete Laboratory Services

1 LEE PLACE
PATERSON 1, NEW JERSEY

Thomas M. Riddick

Consulting Engineer and Chemist

Municipal and Industrial Water Purification, Sewage Treatment, Plant Supervision, Stream Pollution Investigations, Chemical and Bacteriological Analyses.

369 East 149th Street
New York 55, N. Y.

ROBERT AND COMPANY ASSOCIATES

Architects & Engineers

• ATLANTA •

WATER SUPPLY • INCINERATORS
SEWAGE DISPOSAL • POWER PLANTS

Russell & Axon

Consulting Engineers

Geo. S. Russell F. E. Wenger
Joe Williamson, Jr.

Water Works, Sewerage, Sewage Disposal, Power Plants, Appraisals

408 Olive Street — Municipal Airport
St. Louis 2, Mo. — Daytona Beach, Fla.

J. E. SIRRINE Company

Engineers

Water Supply & Purification
Sewage & Industrial Waste Disposal
Stream Pollution Reports
Utilities, Analyses

Greenville — South Carolina

Benjamin L. Smith & Associates

Engineers

Investigations — Reports
Designs — Supervision — Valuations
Municipal Engineering and Public Utilities

11 North Pearl Street
Albany 7, New York

STANLEY ENGINEERING COMPANY

Consulting Engineers

Water Works—Sewerage
Electric Power—Flood Control
Rate Studies—Valuations—Industrial
Airports . . . . . Municipal Buildings

Hershey Bldg., Muscatine, Ia.

Philip B. Streander & Affiliates

Consulting Engineers

120 Tremont St., Boston 8, Mass.

Water Supply, Treatment, Distribution
Trade Wastes, Refuse Disposal
Sewerage, Sewage Treatment
Plans, Supervision, Reports

Weston & Sampson

Water Supply, Water Purification, Sewerage, Sewage and Industrial Waste Treatment, Corrosion Control, Laboratory Service
Supervision, Valuations

14 Beacon St. — Boston, Mass.

Whitman & Howard

Engineers (Est. 1869)

Water Supply, Water Purification, Sewerage, Sewage Disposal, Water Front Improvements and all Municipal and Industrial Development Problems, Investigations, Reports, Designs, Supervision, Valuations.

89 Broad St., Boston, Mass.

WHITMAN, REQUARDT AND ASSOCIATES

Engineers — Consultants

Civil—Sanitary—Structural—Mechanical—Electrical. Reports, Plans, Supervision. Appraisals

1304 St. Paul Street
Baltimore 2, Maryland

(See next page also)

CONSULTING ENGINEERS

Specializing in the Field of

WATER AND SEWAGE WORKS

HITCHCOCK & ESTABROOK, Inc., LESTER D. LEE, Associate

Professional Engineers and Architects

Consultants to Municipalities
since 1920

WATER, SEWERAGE, PAVING, POWER PLANTS, AIRPORTS, REPORTS AND APPRAISALS

521 Sexton Bldg.
Minneapolis 15, Minnesota

BURGESS & NIPLE

Civil and Sanitary Engineers

Water Supply and Purification
Sewerage and Sewage Treatment
Appraisals, Reports, Valuations

584 East Broad Street
Columbus 15, Ohio

MR. CONSULTING ENGINEER

Are you interested in both

WATER & SEWAGE

If so there is no better place for your professional card than in this dual interest magazine

WATER & SEWAGE WORKS

CONTROL *Gas Pressures*

From Digestion Tanks with NORWALK REGULATORS and CHECK VALVES

Handling sewage gas from digestion tanks is one of Norwalk Valve's activities in the manufacture of gas pressure control equipment. Stock items include check valves, pressure relief valves, regulators, all sizes and pressures. Illustrated are the Norwalk Disc Check Valve and the "Meter "Cop" (a Norwalk exclusive).

DESIGN AND FABRICATION OF SPECIAL UNITS

Any unusual problems can be solved by our design and fabrication of special units. Norwalk products are made with ASTM and other materials required by contract specifications.

Outline your requirements in a note to us. We'll be glad to suggest designs and special equipment. We'll also send along a catalogue of our complete line of gas control equipment.

NORWALK VALVE COMPANY

33 RAILROAD AVENUE
SOUTH NORWALK, CONN.

INDEX TO ADVERTISERS

A

Activated Alum Corp. 25A
Alhydro, Inc. 77A
Allis-Chalmers 27A
American Concrete Pipe Ass'n. 26A
*Anthracite Equipment Co. 91A
Atlas Mineral Products Co. 78A

B

Blaw-Knox Co. 25A
Buffalo Meter Co. 85A
*Builders Iron Foundry 12A-23A
*Builders-Providence, Inc. 12A-23A
Byers Co., A. M. 29A

C

Carson Cadillac 87A
Cast Iron Pipe Research Ass'n. 10A-11A
Cement Gun Co. 95A
Chicago Bridge & Iron Co. 13A
*Chicago Pump Company 75A
Crane Co. 15A

D

Darley & Co., W. S. 85A
Darling Valve & Mfg. Co. 22A
De Laval Steam Turbine Co. 28A
Diamond Alkali Co. 11A
Directory of Engineers 100A-101A-102A
Dixie Tank & Bridge Co. 94A
Dorr Co. ..... Inside Back Cover
Dow Chemical Company 80A
Dresser Mfg. Division 21A

E

Eddy Valve Co. 97A

F

Filer & Stowell 92A
*Flexible Sewer-Rod Equipment Co. 90A
*Flexible Underground Pipe-Cleaning Co. 90A
Ford Meter Box Co. 88A
Foxboro Co., The 24A

G

General Electric Co. 8A-9A
Goldak Co. 95A
*Golden-Anderson Valve Specialty Co. 24A
Gorman-Rupp Co., The 18A

H

Hays Mfg. Co. 91A
*Healy-Ruff Co. 99A
*Hellige, Inc. 97A
Hydrauger Corp. 25A
Hydraulic Development Corp. 94A

I

*Infilco, Incorporated 86A
Iowa Valve Co. 98A

J

*Jeffrey Mfg. Co. 98A

L

Layne & Bowler 19A
Leadite Company 96A
Leopold Co., F. B. 98A
Lock Joint Pipe Co. ..... Inside Front Cover

M

*M. & H. Valve Fitting Co. 96A
Mathieson Chemical Corp. 4A
McWane Cast Iron Co. 25A

N

National Technical Labs. 30A
Neptune Meter Company 32A
Northrop & Co., Inc. 87A
Norwalk Valve Co. 102A

O

*Omega Machine Co. 82A

P

Pacific Flush Tank Company 20A
Peerless Pump Div. 84A
Phipps & Bird Inc. 85A
*Pittsburgh-Des Moines Steel Co. 17A
Pittburgh Equitable Meter Co. 5A
Pittsburgh Pipe Cleaner Co. 89A

R

Ridge Tool Co. 83A
Roberts Filter Mfg. Co. 97A
Rockwell Mfg. Co. 3A
Roots-Connersville Blower Corp. 81A

S

Smith Mfg. Co., A. P. 79A
Solvay Sales Div. 93A
Sonken-Galamba Corp. 89A
Sparling, R. W. 99A

T

Taylor Co., W. A. 96A
Tennessee Corp. 18A

U

*U. S. Pipe & Fdry Co. 31A

W

*Wallace & Tiernan Co., Inc. ..... Back Cover
Warren Foundry & Pipe Corp. 87A
Westinghouse Electric Corp. 6A-7A
Williams Gauge Co., The 99A
Wood Company, R. D. 16A

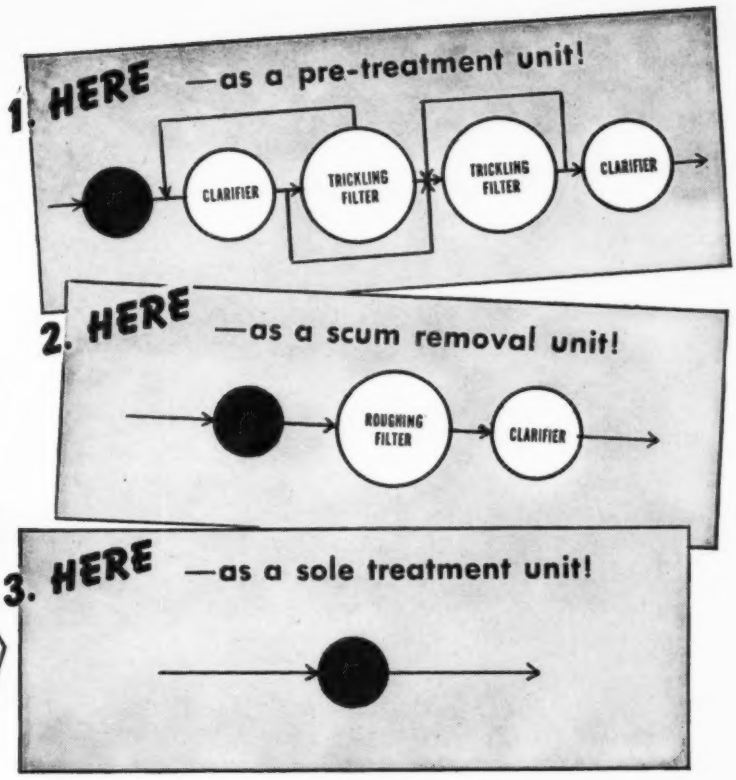
Z

Zeolite Chemical Co. 89A

*Advertisers with * were represented in the May, 1949, Convention and Data Edition with catalog specification copy. Please refer to that issue for additional information on behalf of their products.

in the sewage treatment flowsheet . . .

the DORRCO VACUATOR fits



Operating on the principle of vacuum flotation within an enclosed tank, the Dorrco Vacuator produces three separate products . . . scum and flotable solids . . . grit and settleable solids . . . an effluent. It can be used in the sewage treatment flowsheet to accomplish many results under widely varying conditions . . . of which the following three are typical.

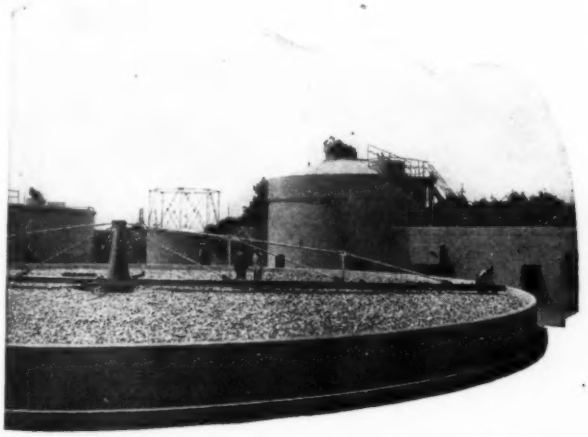
1. As a pre-treatment unit ahead of biologic treatment . . . either trickling filters or activated sludge . . . it will remove scum, grit and a substantial percentage of suspended solids in a single operation.

2. When seasonal loads of canning, packing house or other industrial waste create a scum problem, the Vacuator will relieve the overload, so that the Clarifier maintains satisfactory overall operation.

3. In coastal areas where partial treatment only is permissible, it will adequately remove visual or floating pollution.

With the Vacuator, suspended solids removal will average 40%—B.O.D. removal 25% or better. In *every* type of application the Vacuator will remove grit equalling the performance of the usual grit chamber. These facts are clearly documented by operating results from both municipal and pilot plant installations on all three applications.

A Dorr engineer will explain in detail the applications of the Dorrco Vacuator to your own problem.



Dorrco Vacuator, at right behind filter, installed at the City of Palo Alto, California, handling domestic sewage containing a heavy load of cannery waste. Average design flow, 3.0 M.G.D. . . . peak flow 6.0 M.G.D.

City Engineer: Fabian S. Miller.

Consulting Engineer: Harry N. Jenks, Palo Alto, California.

Contractor: Fred J. Early, Jr., Co., Inc., San Francisco, California.

DORR

RESEARCH [illegible] ENGINEERING [illegible] EQUIPMENT

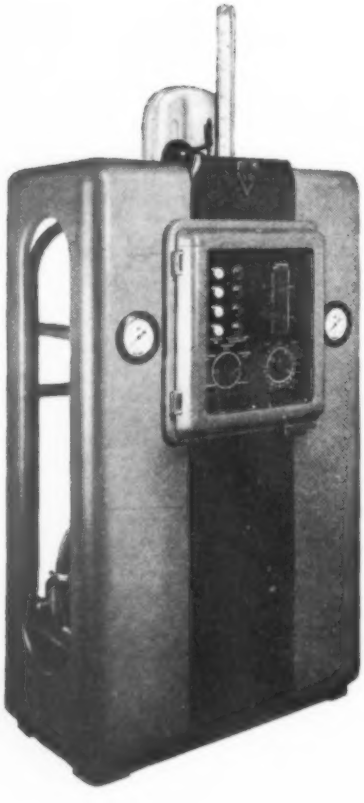
DORRCO

THE DORR COMPANY, ENGINEERS
570 LEXINGTON AVE., NEW YORK 22, N. Y.
ATLANTA • TORONTO • CHICAGO
DENVER • LOS ANGELES
RESEARCH AND TESTING LABORATORIES
WESTPORT, CONN.
SUGAR PROCESSING
PETREE & DORR DIVISION, NEW YORK 22, N. Y.
ASSOCIATES AND REPRESENTATIVES
Dorr Technical Services and Equipment Are Also Available Through Associated Companies and Representatives in the Principal Cities of the World. Names and Addresses on Request.

STREAMLINED

Siva

1949 MODEL



A modern W&T Chlorinator—like the Hindu God Siva—is truly a multi-armed instrument, economically performing sewage plant duties that make operation easier, give extra plant capacity and result in better over-all treatment to help meet more stringent stream pollution controls.

For example, W&T Chlorinators such as the Program Controlled Chlorinator are being used in sewage plants for:

(1) Disinfection
(2) Odor Control
(3) Reduction of corrosion and concrete disintegration
(4) B.O.D. reduction
(5) Improvement of settling
(6) Conditioning of return supernatant liquid
(7) Prevention of sludge bulking
(8) Sludge conditioning
(9) Adjunct in chemical precipitation
(10) Trade waste control
(11) Effluent sterilization

Best of all, this "Siva" is available to work for you at wages that everyone can afford. The average installation represents less than 1% of total plant cost.

To get the complete story on the multiple advantages of sewage chlorination and on W&T Equipment backed by over 35 years' experience, call in your W&T Representative. He'll be glad to help you.